DOCUMENT RESUME

ED 210 990 HE 014 598

TITLE	Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Services. Volume 1: Summary.
INSTITUTION	Health Resources Administration (DHEW/PHS), Hyattsville Md. Office of Graduate Medical Education.
REPORT NO	HRA-81-651
PUB DATE	30 Sep 80
NOTE	115p.; For related documents see ED 203 766-771.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Advisory Committees; *Employment Projections; Foreign Medical Graduates; Futures (of Society); *Graduate Medical Education; Higher Education; *Labor Needs; Labor Supply; Mathematical Models; Medical Schools; *Medicine; Needs Assessment; *Physicians; Position Papers; Predictive Measurement; Specialization; Technical Assistance
IDENTIFIERS	Medically Underserved Areas

ABSTRACT

Results of a three-year study to estimate the future supply and requirements for physicians, which was conducted by the Graduate Medical Education National Advisory Committee (GMENAC), are summarized. The research methodology, which consisted of three mathematical models to project physician supply and requirements, is described, and 40 recommendations to solve health manpower problems of 1990-2000 are presented. Additionally, federal government private commission initiatives from 1955 through 1980 to deal with health manpower problems are considered, and the function of GMENAC technical panels are addressed. The findings indicate the following: there will be 70,000 more physicians than required in 1990; most specialties will have a surplus; some specialties will be in balance (e.g., osteopathic general practice, family practice, general internal medicine, and general pediatrics); shortages will be experienced in psychiatry, physical medicine and rehabilitation, and emergency medicine; and valid criteria for designating geographic areas as adequately served or underserved have not been developed. Among the approaches GMENAC recommends are the following: a 17 percent decrease in U.S. medical school enrollment compared to current levels; sharp restrictions of the entry into the United States of students from foreign medical schools; no further rise in the number of physician health care providers being trained; and prompt adjustments in the number of residency training positions in individual specialties to bring supply into balance with requirements in the 1990s. (SW)

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Summary Report Of The Graduate Medical Education National Advisory Committee

To The Secretary, Department Of Health And Human Services

September 30, 1980

Volume I

ED210990

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U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration

The Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Resources, consists of seven volumes:

Volume I	GMENAC Summary Report
Volume II	Modeling, Research, and Data Technical Panel
Volume III	Geographic Distribution Technical Panel
Volume IV	Financing Technical Panel
Volume V	Educational Environment Technical Panel
Volume VI	Nonphysician Health Care Providers Technical Panel
Volume VII	GMENAC Members' Commentaries and Appendix

September 30, 1980

The Honorable Patricia Roberts Harris
Secretary
Department of Health and Human Services
Washington, D.C. 20201

Dear Madam Secretary:

The attached Report of the Graduate Medical Education National Advisory Committee (GMENAC) is in fulfillment of the Committee's responsibilities under the Charters of April 20, 1976, May 1, 1978, and March 6, 1980.

The charge of the Committee was to advise the Secretary on the number of physicians required in each specialty to bring supply and requirements into balance, methods to improve the geographic distribution of physicians, and mechanisms to finance graduate medical education.

GMENAC significantly advanced health manpower planning in direct and indirect ways.

GMENAC introduced new scientific methodology. Two new mathematical models were developed to estimate physician supply and requirements.

GMENAC refined the data bases; figures for estimating the supply of practitioners in every specialty and subspecialty from the distribution of first-year residency positions have been developed.

GMENAC integrated the estimates of supply and requirements for physicians with nurse practitioners, physician assistants, and nurse-midwives.

GMENAC introduced new concepts to clarify assessment of the geographic distribution of physicians and services; standards are proposed for designating areas as adequately served or underserved based on the unique habits of the people in the area.

GMENAC recommends that medical service revenues continue to provide the major source of funds to support graduate medical education.

GMENAC has initiated a collaboration between the private sector and the government. The unique expertise of each achieves a level of comprehensiveness in health manpower planning not previously experienced.

GMENAC estimates a surplus of 70,000 physicians by 1990. Most specialties will have surpluses, but a few will have shortages. A balance by 1990 cannot be achieved until supply and requirements reached a balance in the 1990's, GMENAC recommends that the surplus be partially absorbed by expansion of residency training positions in general/family practice, general pediatrics, and general internal medicine.

Recommendations are directed at achieving five manpower goals:

1. To achieve a balance between supply and requirements of physicians in the 1990s, while assuring that programs to increase the representation of minority groups in medicine are advanced to broaden the applicant pool with respect to socioeconomic status, age, sex, and race;

2. to integrate manpower planning of physicians and nonphysician providers and to facilitate the function of nonphysician health care providers, when their services are needed;

3. to achieve a better geographic distribution of physicians and to establish improved mechanisms for assessing the adequacy of health services in small areas;

4. to improve specialty and geographic distribution of physicians through financing mechanisms for medical education, graduate medical education, and practice; and

5. to support research for the next phases of health manpower planning.

The Committee unanimously recommends the immediate establishment of a successor to GMENAC. Its establishment is essential to the implementation of the manpower goals and recommendations in the Report. The full GMENAC methodology must be applied to the six specialties which have not been analyzed. The requirements estimates for each of the specialties and subspecialties must be tested, monitored, and reassessed on a continuing basis. Important studies on financing, geography, and nonphysician providers should be undertaken. The collaborative working relationship between the private sector and the government facilitated a congruence of interest in planning and in implementing improvements to best meet the needs of the Nation. The momentum of this collaboration should be continued without interruption.

Respectfully submitted,

Alvin R. Tarlov

Alvin R. Tarlov, M.D.
Chairman
Graduate Medical Education
National Advisory Committee

For the Committee

Enclosure: Volumes I-VII

Summary Report Of The
Graduate Medical Education National Advisory Committee

To The Secretary, Department Of Health And Human Services

Volume I

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration
Office of Graduate Medical Education
DHHS Publication No. (HRA) 81-651

For sale by the Superintendent of Documents, U.S. Government
Printing Office, Washington, D.C. 20402

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Acknowledgments

The preparation of the final report of the Graduate Medical Education National Advisory Committee (GMENAC) was assisted greatly by staff in the Health Resources Administration (HRA) and the National Center for Health Services Research. The Executive Secretary of GMENAC during the last 12 months of the Committee's work. At earlier stages the project was guided by Executive Secretaries Frederick V. Featherstone, Robert Graham, and David R. McNutt, all of whom benefitted from the excellent administrative support of Edna Simon. Sandra Blau, Special Assistant to the Chairman, Alvin R. Tarlov, assisted in the overall coordination. Itzhak Jacoby, Director, Officer of Graduate Medical Education, HRA, was responsible for direction of staff and research development.

Although the Committee members accept all responsibility for this report, the following professional staff members should be cited for their special contributions to this project: Frank L. Aumack, Janet M. Cuca, Alfreda Dempkowski, Barry J. Greengart, Jerald M. Katzoff, Karen A. Rudzinski, and Mary L. Westcott. Other professional staff contributors include: Ingrid Goldstrom, Gail Issen, Joan K. Rosenbach, Judy Rosenstein, Robert Thorner, and Octavious Tracy.

Editorial, graphics, and publication coordination was done by Keith Kost and Jeanne Rogers, Office of Communication, HRA, and by Eleanor F. Wesolowski, OGME. Excellent secretarial assistance was provided by Ramona M. Scott, Jean Meyer, Karen Donaldson, Brenda Stansbury, Beverly Menier, Thelma Nelson, Carolyn Conrad, Mildred V. Reed, and Carol Mattimore. Particular acknowledgment is given to the fine administrative support services provided by Sherry S. Whipple, as well as recent assistance by Norman Cronquist.

A special thanks is given to David R. McNutt, former Director of the Office of Graduate Medical Education, HRA, for his significant contributions during the course of this project. Other contributors to the overall effort were acknowledged earlier in the *Interim Report of the Graduate Medical Education National Advisory Committee.*

Marie Kirchner Stone provided expert editorial assistance in preparation of the Summary Report. Patrick Shaw and Andre King provided graphic design and technical coordination for the GMENAC *Summary Report* (Vol. I).

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On April 20, 1976, the Secretary of the Department of Health, Education, and Welfare established the Graduate Medical Education National Advisory Committee (GMENAC). The charge to the Committee was to advise the Secretary on five national health planning objectives:

A. What number of physicians is required to meet the health care needs of the Nation?

B. What is the most appropriate specialty distribution of these physicians?

C. How can a more favorable geographic distribution of physicians be achieved?

D. What are the appropriate ways to finance the graduate medical education of physicians?

E. What strategies can achieve the recommendations formulated by the Committee?

The Charter of GMENAC indicates specifically that a surplus, or a shortage, of physicians should be avoided and that a balance between supply and requirements for physicians should be achieved through modifications in the numbers of training positions in graduate medical education.

. . . The purpose of this Committee is to analyze the distribution among specialties of physicians and residents and to evaluate alternative approaches to ensure an appropriate balance. The Committee will also encourage bodies controlling the number, types, and geographic location of graduate training positions to provide leadership in achieving the recommended balance . . . and make recommendations to the Secretary on overall strategies on the present and future supply and requirements of physicians by specialty and geographic location; translation of physician requirements into a range of types and numbers of graduate training opportunities needed to approach a more desirable distribution of physician services . . .

A cost-effective health care system that functions with equitable access for each individual in all social, economic, and geographic areas is the Nation's number one health policy objective. This equity of access to health care services, often in conflict with efficiency of expenditure, is the Nation's major health policy problem. The estimated surplus aggregate number of physicians and the projected shortages or surpluses of physicians in varying specialties are neither cost-effective nor do they necessarily improve equity of access. Efficiency of expenditure, only minimal shortages or surpluses of physicians in each specialty, and adequate service in all geographic locations are reasonable expectations. Shortages and surpluses should be corrected while assuring equity of access and efficiency of expenditure.

After three years of comprehensive health manpower analysis, the Graduate Medical Education National Advisory Committee, collaborating in an intense relationship between the Federal Government and the health professions, working with panels of experts, assisted by technical staff from the Department of Health and Human Services, and debating in public forum, has identified seven major health manpower problems with the words—TOO MANY, IMBALANCES, UNEVEN, COMPLEX, UNKNOWN, and UNCERTAIN.

There will be TOO MANY physicians in 1990. There will be substantial IMBALANCES in some specialties. There will continue to be a marked UNEVENNESS in the geographic distribution of physicians. The country may be training TOO MANY nonphysician providers for 1990. The factors influencing specialty choice are COMPLEX. The actual cost of graduate medical education is UNKNOWN. Economic motivation in specialty and geographic choice is UNCERTAIN.

Problem 1: A Surplus of Physicians Will Occur in 1990 and 2000

a. In 1990 there will be 70,000 more physicians than required to provide physician services (536,000 supply, 466,000 requirements).

b. By 2000 there will be 145,000 more physicians than required to provide physician services (643,000 supply, 498,000 requirements).

c. The expected entry into practice over the next 10 years of 40,000 to 50,000 graduates of foreign medical schools accounts for more than half of the 70,000 physician surplus.

Problem 2: Shortages or Surpluses Will Be Present in Some Specialties in 1990 (See Figure 1).

Problem 3: An Increase in Nonphysician Health Care Providers

The continued expansion of the number of nurse practitioners, physician assistants, and other nonphysician health care providers aggravates the impending physician surplus and poses a public policy dilemma.

Problem 4: Uneven Geographic Distribution of Physicians

The uneven geographic distribution of physicians, the uneven rates of utilization of health services, the absence of geographically defined functional medical service areas, and thus the absence of criteria for designating an area as adequately or inadequately served interferes with health manpower planning.

Problem 5: Medical School Role in Specialty Choice Unclear

Modification of the educational environment to influence specialty choice is unlikely, by itself, to be successful because the decisions made by students are heavily influenced by premedical school and post-training factors.

Problem 6: Costs of Graduate Medical Education Unknown

The true costs of graduate medical education are unknown because the funds are derived from many different sources. It is currently impossible to separate the cost of resident education from the cost or benefit of the health services provided simultaneously. The reporting procedures on costs of training vary widely from one institution to another and often exclude the indirect costs.

Problem 7: Financial Influences in Specialty Choice Uncertain

Financial motivating forces are thought by some to be powerful influences on specialty and geographic choices; yet the empirical evidence to date is equivocal.

GMENAC examined each of these seven problems in detail and recommended a combination of private and governmental initiatives to resolve them.

Figure 1

Ratio % of Projected Supply to Estimated Requirements-1990

		Ratio%	Requirements	Surplus (shortage)
Shortages	Child Psychiatry	45%	9,000	(4,900)
	Emergency Medicine	70%	13,500	(4,250)
	Preventive Medicine	75%	7,300	(1,750)
	General Psychiatry	80%	38,500	(8,000)
Near Balance	Hematology/Oncology-Internal Medicine	90%	9,000	(700)
	Dermatology	105%	6,950	400
	Gastroenterology-Internal Medicine	105%	6,500	400
	Osteopathic General Practice	105%	22,000	1,150
	Family Practice	105%	61,300	3,100
	General Internal Medicine	105%	70,250	3,550
	Otolaryngology	105%	8,000	500
	General Pediatrics and Subspecialties	115%	36,400	4,950
Surpluses	Urology	120%	7,700	1,650
	Orthopedic Surgery	135%	15,100	5,000
	Ophthalmology	140%	11,600	4,700
	Thoracic Surgery	140%	2,050	850
	Infectious Diseases-Internal Medicine	145%	2,250	1,000
	Obstetrics/Gynecology	145%	24,000	10,450
	Plastic Surgery	145%	2,700	1,200
	Allergy/Immunology-Internal Medicine	150%	2,050	1,000
	General Surgery	150%	23,500	11,800
	Nephrology-Internal Medicine	175%	2,750	2,100
	Rheumatology-Internal Medicine	175%	1,700	1,300
	Cardiology-Internal Medicine	190%	7,750	7,150
	Endocrinology-Internal Medicine	190%	2,050	1,800
	Neurosurgery	190%	2,650	2,450
	Pulmonary-Internal Medicine	195%	3,600	3,350
	*Physical Medicine and Rehabilitation	75%	3,200	(800)
	*Anesthesiology	95%	21,000	(1550)
	*Nuclear Medicine	N/A	4,000	N/A
	*Pathology	125%	13,500	3,350
	*Radiology	155%	18,000	9,800
	*Neurology	160%	5,500	3,150

*The requirements in these six specialties were estimated crudely after a review of the literature. They should be considered as very rough approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980–81.

The assumptions used to project 1990 supply numbers are stated in case 2, in Notes to Figure 2, and in footnote a, Table 1.

Supply numbers for nuclear medicine are not available.

III. Physician Supply and Requirements for 1990: Results of GMENAC Methodology

Estimation of the number of physicians required in each specialty to meet the health care needs of the Nation in a future year is the core of GMENAC's objectives. The mathematical models developed by GMENAC provide estimates of the expected supply of physicians. The difference between supply and requirements yields either a balance, a surplus, or a shortage. Figures 1 and 2 and Tables 1-7 display the findings of the GMENAC undertaking.

These results are the product of a new GMENAC methodology described in Section VI, and the basis for many of the recommendations stated in Chapter IV. The sources of data used in these Tables are: the U.S. Census Data on Population Projections, the American Medical Association, and American Osteopathic Association enumeration of physicians by specialty, the epidemiologic data on the incidence/prevalence of disease and norms of care, and the published information on physician productivity. The data on prevalence, norms, and productivity for the Requirements Model were estimated for 1990 by the Delphi Panel experts using as baseline the hard data for 1978.

The data in Figures 1 and 2 and Tables 1-7 are based both on data and on Delphi estimates, where actual data were unavailable. The calculations are the results of the combined expertise and judgment of the members and staff of the Technical Panel on Modeling, the Delphi Panel Experts, and the full GMENAC Committee. To interpret accurately the findings of the composite Figure and the specific Tables, several caveats need explanation:

1. The year 1990 was selected as the target date because a 10-year interval is required between initiating changes in training and effecting a change on physician supply.

2. The numbers for medical schools, graduates, residents, and physicians combine both osteopathic and allopathic professions, except for osteopathic general practice and allopathic family practice which are reported separately.

3. The numbers related to physician supply and requirements include graduates of U.S. medical schools and alien and U.S. citizen graduates of foreign medical schools.

4. All estimated supply numbers are predicated on three assumptions: That first-year enrollment in the 126 U.S. allopathic medical schools will increase 2.5 percent per year until 1982-83 for a total increase of 10 percent over the 1978-79 enrollment of 16,501 and then remain constant at 18,151; that first-year enrollment in the 14 U.S. osteopathic medical schools will increase 4.6 percent per year until 1987-88 for a total increase of 41 percent over the 1978-1979 level of 1,322 and then remain constant at 1,868; and that 3,100 graduates of foreign medical schools were added to the residency pool in 1979-80, and that number will increase to 4,100 by 1983-84 and then remain constant at that level in future years. Figure 1 displays four different supply projections; each uses a different set of assumptions. Case 2 in Figure 1 uses the previous three assumptions and is considered by GMENAC the most likely future course.

5. Residents in training have been added to the supply numbers at a rate of 0.35 times their number. GMENAC, after studying available data on allocation of resident time among patient care, education, and research, has estimated that residents provide direct health services at approximately 35 percent the level of a full-time practicing physician.

6. The relationship between the supply of physicians and the U.S. population is expressed variably by different health system analysts. The Tables in this section use two conventions: physicians per 100,000 population (See Table 2), and population size served by one physician (See Table 4).

7. Six specialties, neurology, physical medicine and rehabilitation, anesthesiology, pathology, radiology, and nuclear medicine, have not been studied in depth by GMENAC at the time of this Report. Requirements estimates in these specialties were derived crudely by GMENAC from a review of previous manpower studies completed by individual specialty societies and by brief communication with representatives of the specialty societies through telephone, mail, and at the public plenary session of July 27-29, 1980. The estimates should be considered approximate and tentative. The full GMENAC methodology will be applied to these six specialties in 1980-81.

The aggregate surplus of physicians compared to requirements is displayed in Figure 2 and Tables 1 and 2. The imbalance between supply and requirements in each of the 22 specialties and 16 subspecialties is presented in Tables 3, 4, and 5. Examples of modifications in the number of first-year entrance positions for training in each discipline to move supply toward a balance with requirements are given in Tables 6 and 7.

Figure 2 and Tables 1 and 2: Aggregate Physician Supply and Requirements 1978, 1990, and 2000

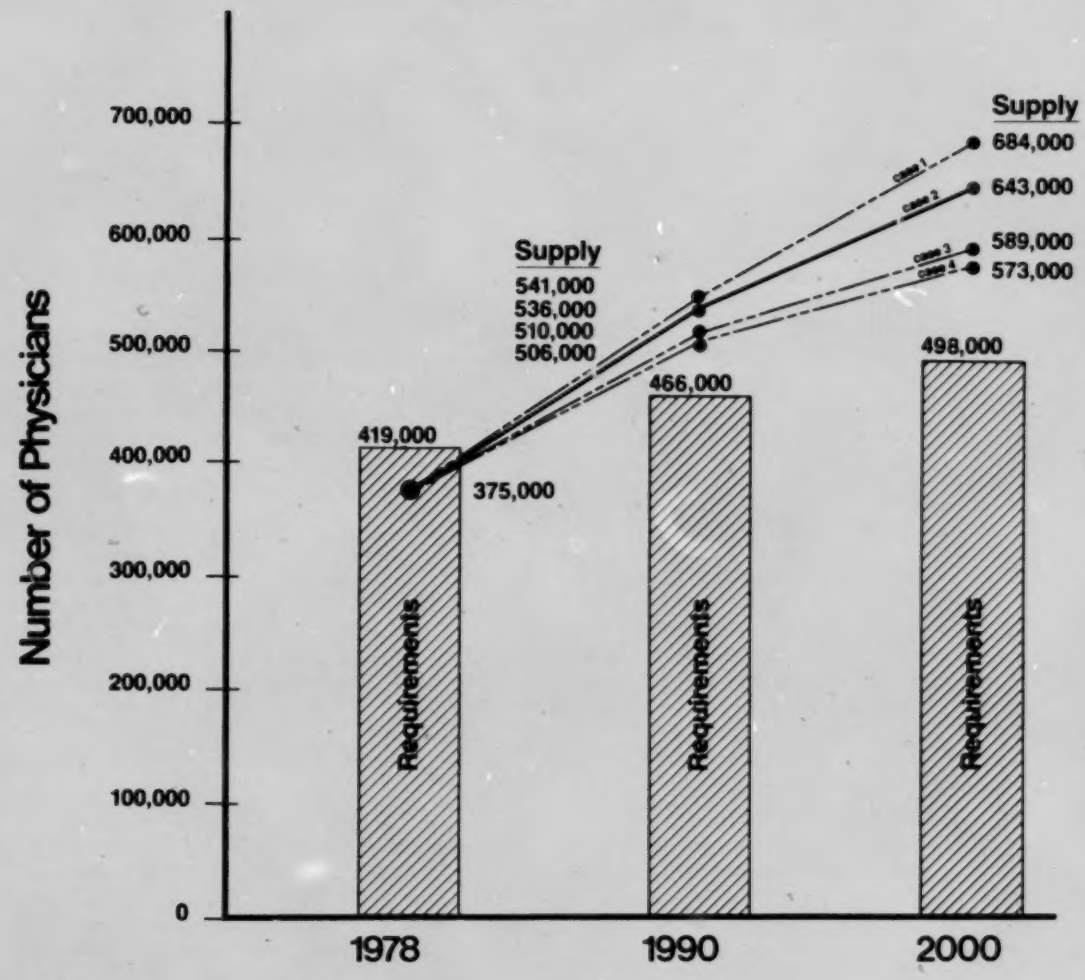
Estimates of aggregate physician supply for 1990 and 2000 depend on two variables: Medical school enrollment, and entry of graduates from foreign medical schools into U.S. training positions and into practice. Figure 2 displays four examples of supply estimates, each based on a different set of assumptions. GMENAC considers Case 2 most likely. The data from Case 2 are used exclusively in the supply projections of Tables 1-5.

Table 1 shows a surplus of 70,000 physicians beyond requirements in 1990 and a surplus of 145,000 by the year 2000.

Table 2 shows that the growth rate in the number of physicians will be three and a half times greater than the growth rate in the population over the same period. The ratio of physicians to population in 1978 was 171 to 100,000, in 1990 it will be 220 to 100,000 (29 percent increase), and in the year 2000 the ratio will be 247 physicians to 100,000 populaiton (44 percent increase). This last ratio is now at the top 10 percent of all countries in the world.

Figure 2

Aggregate Physician Supply & Requirements Under Four Assumptions 1978, 1990, 2000



Notes to Figure 2

Aggregate Physician Supply and Requirements (1978, 1990, 2000) Under Four Sets of Assumptions.

Case 1: Assumes

- A continuous **Increase** in the first-year enrollment in U.S. *allopathic medical schools* at the rate of 2.5 percent per year over the 1978–79 number of 16,501.
- A continuous **Increase** in the first-year enrollment in the U.S. *osteopathic medical schools* at the rate of 4.6 percent per year over the 1978–79 number of 1,322.
- *FMGs* (all types) will be added to the residency pool at the rate of 3,100 per year in 1979, will **increase** to 4,100 in 1983 and then will remain at that level.

**Case 2: Assumes*

- An **Increase** in the first-year enrollment in U.S. *allopathic medical schools* at the rate of 2.5 percent per year until 1982–83 for a total increase of 10 percent over the 1978–79 number of 16,501, and then will remain level at 18,151.
- An **Increase** in the first-year enrollment in U.S. *osteopathic medical schools* at the rate of 4.6 percent per year until 1987–88 for a total increase of 41 percent over the 1978–79 number of 1,322, and then will remain level at 1,868.
- *FMGs* will be added to the residency pool at the rate of 3,100 per year in 1979, will **increase** to 4,100 in 1983, and then will remain at that level.

Case 3: Assumes

- An **Increase** in the first-year enrollment in U.S. *allopathic medical schools* at the rate of 2.5 percent per year for a total increase of 7.5 percent over the 1978–79 number of 16,501 and then will remain level at 17,739.
- An **Increase** in the first-year enrollment in U.S. *osteopathic medical schools* at the rate of 6.1 percent per year for a total increase of 18.2 percent over the 1978–79 number of 1,322, and then will remain level at 1,562.
- *FMGs* will be added to the residency pool at the rate of 3,100 per year in 1979, will **decrease** to 1,350 by 1983, and then will remain at that level.

Case 4: Assumes

- Beginning in 1981, both *allopathic and osteopathic medical* school first-year enrollment will **decrease** 10 percent by 1984 to 16,041 compared to the 1978–79 enrollment of 17,823, and then will remain at that level.
- *FMGs* will be added to the residency pool at the rate of 3,100 per year in 1979, will **decrease** to 1,350 in 1983, and then will remain at that level.

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*Case 2 is considered by GMENAC to be the most likely course, and is used in Tables 1–7 which follow.

All supply numbers include 35% of the number of residents in training in the given year.

Aggregate Physician Supply and Requirements: 1978, and Estimates for 1990 and 2000

	1978	1990	2000
Physician Supply[a]	374,800	535,750	642,950
Physician Requirements[b]	418,550	466,000	498,250
Surplus (Shortage)	(43,750)	69,750	144,700

[a] Includes all professionally active physicians (MDs and DOs) together with 0.35 of all residents and fellows in training in the year indicated. The 1990 and 2000 figures assume that U.S. allopathic medical school first-year enrollment will increase 2.5 percent per year until 1982–83 for a total increase of 10 percent over the 1978–79 enrollment of 16,501, and then will remain level at 18,151, that U.S. osteopathic medical school enrollment will increase 4.6 percent per year until 1987–88 for a total increase of 41 percent over the 1978–79 number of 1,322, and then will remain level at 1,868, and that FMGs will be added to the residency pool at the rate of 3,100 per year in 1979–80, increase to 4,100 per year by 1983, and then remain level. (Case 2, Figure 2) All supply data in the following tables have been calculated using these assumptions.

[b] The 1978 and 2000 figures on requirements are extrapolated from the 1990 calculated requirements simply on the basis of the population differences in the 3 years.

Aggregate Physician Supply, Total U.S. Population, and Physician-to-Population Ratio: 1978, and Estimates for 1990 and 2000

	1978	1990	Percent Increase (1978–1990)	2000	Percent Increase (1978–2000)
Population (thousands)	218,717[a]	243,513[b]	11%	260,378[b]	19%
Physician Supply[c]	374,800	535,750	43%	642,950	72%
Physician/100,000 population	171	220	28%	247	44%

[a] U.S. Census, Series P-25, Number 888, *Current Population Reports*, "Estimates of U.S. Population to May 1, 1980," issued July 1980.

[b] U.S. Census, Series P-25, Number 704, *Current Population Reports*, "Projection of Population of United States, 1977–2050," issued July 1977.

[c] Assumptions are stated in footnote "a" to Table 1 above.

Table 3

Supply of Physicians by Specialty: 1978, and Estimates for 1990

	1978[a]	1990[a]	Percent Change
All Physicians	374,800	535,750	+43
Osteopathic General Practice	13,550	23,850	+76
General/Family Practice	54,350	64,400	+18
General Pediatrics	23,800	37,750	+59
Pediatric Allergy	450	900	+100
Pediatric Cardiology	600	1,000	+67
Pediatric Endocrinology	N/A[b]	250[b]	N/A
Pediatric Hematology-Oncology	N/A[b]	550[b]	N/A
Pediatric Nephrology	N/A[b]	200[b]	N/A
Neonatology	N/A[b]	700[b]	N/A
General Internal Medicine	48,950	73,800	+51
Allergy and Immunology	2,100	3,050	+45
Cardiology	7,700	14,900	+94
Endocrinology	1,400	3,850	+175
Gastroenterology	2,900	6,900	+138
Hematology-Oncology	3,000	8,300	+177
Infectious Diseases	850	3,250	+282
Nephrology	1,450	4,850	+235
Pulmonary Diseases	2,800	6,950	+148
Rheumatology	1,000	3,000	+200
Neurology	4,850	8,650	+78
Dermatology	5,000	7,350	+47
Psychiatry (General)	25,250	30,500	+21
Child Psychiatry	3,050	4,100	+34
Obstetrics-Gynecology	23,100	34,450	+49
General Surgery	30,700	35,300	+15
Neurosurgery	3,000	5,100	+70
Ophthalmology	11,750	16,300	+39
Orthopedic Surgery	12,350	20,100	+63
Otolaryngology	6,100	8,500	+39
Plastic Surgery	2,600	3,900	+50
Thoracic Surgery	2,100	2,900	+38
Urology	7,100	9,350	+32
Emergency Medicine	5,000	9,250	+85
Preventive Medicine	6,100	5,550	-9
Anesthesiology	14,850	19,450	+31
Nuclear Medicine	N/A[c]	N/A[c]	N/A
Pathology	12,650	16,850	+33
Physical Medicine & Rehabilitation	2,000	2,400	+20
Radiology	18,550	27,800	+50
All other and unspecified	14,000	9,700	-31

N/A not available

[a] Assumptions are stated in footnote "a" to Table 1 on page 10.

[b] The 1978 AMA masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore the 1990 supply for these pediatric subspecialties is likely to be significantly underenumerated.

[c] The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been omitted.

Tables 3, 4, and 5: Specialty-Specific Physician Supply and Requirements 1978 and 1990.

Table 3 estimates an increase in the supply of physicians for almost all of the specialties and subspecialties. Increases by 1990 range from 12 percent for family practice, 15 percent for general surgery, 49 percent for obstetrics and gynecology, 51 percent for general internal medicine, 59 percent for pediatrics, to 77 percent for osteopathic general practice. The increases will be even greater in some other disciplines.

Table 4 shows one physician per 580 persons in 1978 and one physician per 455 persons in 1990. Calculations document similar substantial increases in some specialties and subspecialties.

Table 5 shows shortages in some disciplines that range from 8,000 in general psychiatry and 4,900 in child psychiatry to 1,100 in pediatric hematology/oncology. It also shows surpluses in many disciplines that include 11,800 in general surgery, and 10,400 in obstetrics/gynecology. A near balance is shown in eight disciplines including four specialties identified with primary care: Osteopathic general practice, family practice, general pediatrics, and general internal medicine.

Tables 6 and 7: Illustrative Adjustments in the Number of First-Year Entrants into Residency and Fellowship Training

The control points of the specialty distribution of physicians are the filled first-year residency positions in each of the specialties and subspecialties. In some fields, family practice and general internal medicine, for example, entry occurs almost entirely in the first year after graduation from medical school, PGY-1 (postgraduate year one). In others, for example, the pediatric and internal medicine subspecialties, entry occurs after several years of prior residency training in the parent specialty, usually at PGY-4. In still others, like psychiatry and orthopedic surgery, some enter at PGY-1 and others at PGY-2 through 5. For all, the first year of training in the specialty, regardless of the postgraduate year, is referred to as R-1 (Resident-1 or Fellow-1). A comprehensive and integrated approach to manpower planning using entry rates as a key variable requires that all of the R-1s be accounted for, the PGY-1 entrants as well as those who enter after prior years of training in another specialty. Therefore, two Tables have been constructed: Table 6 for PGY-1 entrants and Table 7 for the total number of entrants regardless of the year past graduation, the R-1s.

The Committee recognizes that the numbers assigned to the surpluses or shortages in any specialty may convey a level of precision greater than the methodology allows. For illustrative purposes, nevertheless, we present in Tables 6 and 7 the effect of changing the entry rates into each of the specialties in the direction intended to reduce the imbalances.

Table 4

U.S. Population Per One Physician, Specialty-Specific: 1978, and Estimates for 1990

	1978[a] (pop. 218,717,000)[b]		1990[a] (pop. 243,513,000)[b]	
All Physicians	1 per	580	1 per	455
Osteopathic General Practice	1 per	16,000	1 per	10,200
General/Family Practice	1 per	4,000	1 per	3,800
General Pediatrics	1 per	9,200	1 per	6,500
Pediatric Allergy	1 per	468,300	1 per	270,600
Pediatric Cardiology	1 per	344,400	1 per	243,500
Pediatric Endocrinology		N/A		N/A
Pediatric Hematology-Oncology		N/A		N/A
Pediatric Nephrology		N/A		N/A
Neonatology		N/A		N/A
General Internal Medicine	1 per	4,500	1 per	3,300
Allergy and Immunology	1 per	103,300	1 per	79,800
Cardiology	1 per	28,400	1 per	16,300
Endocrinology	1 per	158,100	1 per	63,300
Gastroenterology	1 per	75,300	1 per	35,300
Hematology-Oncology	1 per	72,600	1 per	29,300
Infectious Diseases	1 per	250,500	1 per	74,900
Nephrology	1 per	148,900	1 per	50,200
Pulmonary Diseases	1 per	78,700	1 per	35,000
Rheumatology	1 per	218,300	1 per	81,200
Neurology	1 per	45,000	1 per	28,200
Dermatology	1 per	43,600	1 per	33,100
Psychiatry (General)	1 per	8,700	1 per	8,000
Child Psychiatry	1 per	71,900	1 per	59,400
Obstetrics-Gynecology	1 per	9,500	1 per	7,100
General Surgery	1 per	7,100	1 per	6,900
Neurosurgery	1 per	73,300	1 per	47,700
Ophthalmology	1 per	18,600	1 per	14,900
Orthopedic Surgery	1 per	17,700	1 per	12,100
Otolaryngology	1 per	36,000	1 per	28,600
Plastic Surgery	1 per	84,300	1 per	62,400
Thoracic Surgery	1 per	103,500	1 per	84,000
Urology	1 per	30,800	1 per	26,000
Emergency Medicine	1 per	43,800	1 per	26,300
Preventive Medicine	1 per	35,800	1 per	43,900
Anesthesiology	1 per	14,700	1 per	12,500
Nuclear Medicine		N/A		N/A
Pathology	1 per	17,300	1 per	14,500
Physical Medicine & Rehabilitation	1 per	109,200	1 per	101,500
Radiology	1 per	11,800	1 per	8,800
All other and unspecified	1 per	15,600	1 per	25,100

N/A–not available.

[a] Assumptions are stated in footnote "a" to Table 1 on page 10.

[b] The total U.S. population number was utilized for each calculation in this table. The numbers are not adjusted by age for pediatrics specialties or by age and sex for obstetrics-gynecology.

Note: Unrounded supply estimates were used in the calculations for this table.

Table 5

Specialty-Specific Physician Supply & Requirements: Surplus & Shortage Estimates for 1990

	Physicians[a]	Total Residents/ Fellows	Total Supply[b,c]	Require-ments	Surplus (Shortage)
All Physicians	504,750	88,500	535,750	466,000	69,750
Osteopathic General Practice	23,050	2,300	23,850	22,750	1,150
General/Family Practice	61,750	7,600	64,400	61,300	3,100
General Pediatrics	35,300	7,050	37,750	30,250	7,500
Pediatric Allergy	750	450	900	900	—
Pediatric Cardiology	850	400	1,000	1,150	(150)
Pediatric Endocrinology	250	N/A	250	800	(550)[d]
Pediatric Hematology-Oncology	500	200	550	1,650	(1,100)[d]
Pediatric Nephrology	200	N/A	200	350	(150)[d]
Neonatology	700	N/A	700	1,300	(600)[d]
General Internal Medicine	66,500	20,800	73,800	70,250	3,550
Allergy and Immunology	3,000	150	3,050	2,050	1,000
Cardiology	14,250	1,900	14,900	7,750	7,150
Endocrinology	3,700	500	3,850	2,050	1,800
Gastroenterology	6,550	1,000	6,900	6,500	400
Hematology-Oncology	7,850	1,300	8,300	9,000	(700)
Infectious Diseases	3,050	500	3,250	2,250	1,000
Nephrology	4,600	700	4,850	2,750	2,100
Pulmonary Diseases	6,600	1,050	6,950	3,600	3,350
Rheumatology	2,850	500	3,000	1,700	1,300
*Neurology	8,300	950	8,650	5,500*	3,150*
Dermatology	7,150	700	7,350	6,950	400
Psychiatry (General)	29,250	3,550	30,500	38,500	(8,000)
Child Psychiatry	4,050	200	4,100	9,000	(4,900)
Obstetrics-Gynecology	32,300	6,200	34,450	24,000	10,450
General Surgery	32,100	9,200	35,300	23,500	11,800
Neurosurgery	4,850	700	5,100	2,650	2,450
Ophthalmology	15,400	2,600	16,300	11,600	4,700
Orthopedic Surgery	19,000	3,150	20,100	15,100	5,000
Otolaryngology	8,000	1,400	8,500	8,000	500
Plastic Surgery	3,700	600	3,900	2,700	1,200
Thoracic Surgery	2,700	450	2,900	2,050	850
Urology	8,800	1,600	9,350	7,700	1,650
Emergency Medicine	8,900	1,000	9,250	13,500	(4,250)
Preventive Medicine	5,550	N/A	5,550	7,300	(1,750)
*Anesthesiology	18,750	2,050	19,450	21,000*	(1,550)*
*Nuclear Medicine	N/A	N/A	N/A[e]	4,000*	N/A[f]
*Pathology	16,000	2,450	16,850	13,500*	3,350*
*Physical Medicine & Rehabilitation	2,350	150	2,400	3,200*	(800)*
*Radiology	26,450	3,800	27,800[e]	18,000*	9,800*
All other and unspecified	9,200	1,450	9,700	—	N/A

Notes to Table 5

N/A–Not available.

*The requirements in these six specialties were estimated crudely after a brief review of the literature. They should be considered approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980–81.

[a]Excludes residents and fellows.

[b]Assumptions are stated in footnote "a" to Table 1 on page 10.

[c]Residents and fellows in training have been added to the supply figures at a rate of 0.35 times their number. GMENAC has estimated that residents and fellows provide direct health services at approximately 35 percent the level of a full-time practicing physician.

[d]The 1978 AMA masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore, the 1990 supply for these pediatric subspecialties are likely to be significantly under enumerated, and calculations of shortage may contain larger errors.

[e]There may be approximately 3,000 nuclear medicine specialists at the present time. Accurate enumeration is impossible because many list their principal specialty as radiology. The supply and the estimated surplus of radiologists, therefore, may be inflated.

[f]The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been omitted, and calculations of surplus, balance, or shortage cannot be made.

Table 6

Illustrative Rates of Entry Into First-Year Graduate Medical Education (PGY-1) for 1986–87

	Projected 1990 Surplus (Shortage)	1979–80 GME Entry Rates at PGY-1 Level	1986–87 Illustrative Trend % Change	1986–87 GME Entry Rates at PGY-1
TOTAL		20,474	–2	20,030
Osteopathic Interns	1,150	1.050	–2	1,030[a]
Flex Interns	N.A.	1,325	+15	1,500[b]
Family Practice	3,100	2,347	(c)	2,347
General Pediatrics and Subspecialties	4,950	2,030	(c)	2,030
General Internal Medicine	3,550	6,730	(c)	6,730
Obstetrics–Gynecology	10,450	1,100	–20	880
*Neurology	3,150 *	113	0	113
Dermatology	400	13	0	13
Psychiatry	(8,000)	714	+20	856
General Surgery	11,800	2,817	–20	2,254
Neurosurgery	2,450	31	–20	25
Ophthalmology	4,700	65	–20	52
Orthopedic Surgery	5,000	240	–20	192
Otolaryngology	500	40	0	40
Urology	1,650	60	–2	48
Emergency Medicine	(4,250)	225	N.A.[d]	400
*Anesthesiology	(1,550)*	400	–10	510
*Pathology	3,350 *	559	–5	531
*Physical Med. & Rehab.	(800)*	85	+20	102
*Radiology	9,800 *	470	–20	376

N.A.–Not applicable.

*The requirements in these five specialties were estimated crudely after a brief review of the literature. They should be considered approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980–81.

[a]Derived using the same proportional decrease (minus 2 percent) in the total number of positions for allopathic medicine between 1979–80 and 1986–87.

[b]These positions provide the first-year clinical training for several specialties and are likely to be called the transitional year in the future. Therefore, GMENAC suggests a 15 percent increase in the number of these positions.

[c]While the 1990 projected supply is slightly greater than requirements for all three of these specialties, GMENAC suggests that the current number of residency positions be retained in the 1980s in order to accommodate the anticipated surplus in the aggregate number of residents and physicians.

[d]The following assumptions were used to project the 1990 emergency medicine supply: 225 residents completed their training in 1980; this number will increase to 40[illegible] by 1983 and then will remain at that level.

Table 7

Illustrative Rates of Entry into Specialty Training (R-1) for 1986–87

	1990 Estimated Surplus (Shortage)	1979–80 Specialty Entry Rates at R-1[a]	1986–87 Illustrative Trend % Change	1986–87 Specialty Entry Rates at R-1[a]
TOTAL		26,851	–5	25,554
Osteopathic Residents	1,150	1,470[b]	–5	1,399[b]
Family Practice	3,100	2,347	(c)	2,347
General Pediatrics and Subspecialties	4,950	2,122	(c, d)	2,122[d]
General Internal Medicine	3,550	6,729	(c)	6,729
Allergy and Immunology	1,000	65	–20	52
Cardiology	7,150	701	–20	561
Endocrinology	1,800	181	–20	145
Gastroenterology	400	367	0	367
Hematology-Oncology	(700)	472	+5	496
Infectious Diseases	1,000	202	–20	162
Nephrology	2,100	266	–20	213
Pulmonary Diseases	3,350	387	–20	310
Rheumatology	1,300	186	–20	149
Obstetrics/Gynecology	10,450	1,244	–20	995
*Neurology	3,150 *	437	0	437
Dermatology	400	282	0	282
Psychiatry	(8,000)	1,010	+20	1,212
Child Psychiatry	(4,900)	271	+20	325
General Surgery	11,800	2,817	–20	2,254
Neurosurgery	2,450	127	–20	102
Ophthalmology	4,700	505	–20	404
Orthopedic Surgery	5,000	684	–20	547
Otolaryngology	500	293	0	293
Plastic Surgery	1,200	202	–20	162
Thoracic Surgery	850	134	–10	121
Urology	1,650	293	–20	234
Emergency Medicine	(4,250)	225	N.A.	400
Preventive Medicine	(1,750)	98	+20	118
Occupational/Aerospace	(e)	65	+20	78
*Anesthesiology	(1,550)*	675	+10	743
*Nuclear Medicine	N/A[f]	118	0	118
*Pathology	3,350 *	735	–5	698
*Physical Med. & Rehab.	(800)*	159	+20	190
*Radiology	9,800 *	922	–20	738

N.A.–Not applicable.
N/A–Not available.
*The requirements in these six specialties were estimated crudely after a brief review of the literature. They should be considered approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980–81.

[a]These figures include the filled positions exhibited in Table 6, other than the flexible internships and osteopathic internships.

[b]The number for osteopathic residents includes all trainees beyond the PGY-1 level.

[c]While the 1990 projected supply is slightly greater than requirements for all three of these specialties, GMENAC suggests that the current number of residency positions be retained in the 1980s in order to accommodate the anticipated surplus in the aggregate number of residents and physicians.

[d]It is suggested that the same number of positions be retained for the pediatric subspecialties until better data concerning their supply and training rates are available.

[e]Included as part of preventive medicine

[f]The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. The 1978 and 1990 supply estimates probably are significantly undercounted. Therefore, the supply estimates for nuclear medicine have been omitted, and calculations of surplus, balance, or shortage cannot be made.

Notes to Tables 1 through 7

1. The supply projections include MDs and DOs and are calculated from the following data sources: 1978 American Medical Association masterfile; 1979 American Osteopathic Association Survey; and The Directory of Residency Training Programs, 1979–80 Edition, Liaison Committee on Graduate Medical Education/American Medical Association.

The osteopathic physicians in general practice are reported separately from the allopathic family/general physicians. The small number of osteopathic physicians (Table 8) in the other specialties are included with the allopathic numbers.

Family practice in these Tables refers to both allopathic family physicians and allopathic general practitioners. Since the number of the latter in 1990 will be very small, the designation family practice is used for the combined group.

The sum of the specialty-specific supply estimates exceeds the total due to rounding, and the fact that psychiatry and neurology, as well as ophthalmology and otolaryngology, are combined specialties for osteopathic medicine. In the tables the numbers for each of these four specialties include osteopathic physicians, thus creating a double count. Their number is included in the total only once.

The supply numbers include professionally active physicians (MDs and DOs) together with 35 percent of all residents and fellows in training in that year. GMENAC has estimated that residents and fellows provided direct health services at approximately 35% the level of full-time practicing physicians.

2. The 1978 AMA Masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore, the 1990 supply for the pediatric subspecialties in Tables 3 and 5 is likely to be significantly underenumerated, and calculations of shortage may contain large errors.

3. General internal medicine includes diabetes, geriatrics, and nutrition.

4. The 1978 fellowship numbers for the internal medicine subspecialties are taken from results of a manpower survey by the Federated Council of Internal Medicine.

5. Hematology-oncology includes neoplastic diseases.

6. General surgery includes colon and rectal surgery, pediatric surgery, and portions of vascular surgery.

7. The following assumptions were used to project the 1990 emergency medicine supply: 225 residents completed their training in 1980; this number will increase to 400 by 1983 and then will remain at that level.

8. Preventive medicine includes public health, occupational medicine, and aerospace medicine.

9. The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine in these tables have been omitted, and calculations of surplus, balance, or shortage cannot be made.

10. Neurology includes pediatric neurology.

11. Both supply projections and requirements estimates include physicians engaged primarily in research, teaching, and administration, as well as patient care.

Solutions to health manpower problems are attainable. The past record shows that both the private and the Government sectors have successfully implemented many solutions. Unanticipated side effects have however, discredited some of these approaches. Unlike past efforts the present GMENAC solutions are the result of joint planning between the medical profession and the Government. This collaborative effort is less random than previous approaches and promises a more comprehensive and long-term plan for change.

Solutions to health manpower problems can be achieved through a variety of mechanisms ranging in scope from Federal control to individual initiatives. At one end of the spectrum, solutions can be initiated voluntarily by the professions and, at the other end, corrective mechanisms can be approached through central regulation by law or other authoritative measures. GMENAC strongly favors mechanisms of volunteerism in the context of a collaborative relationship between the medical profession and Government.

GMENAC's solution to health manpower problems was approached by identifying the major components or the determinants of manpower supply/requirements. Solutions were conceived by Technical Panelists in their five areas of exploration through a series of specific recommendations by each Panel. The Technical Panel on Modeling Physician Supply and Requirements (also referred to as the Technical Panel on Modeling, Research, and Data) developed mathematical models for determining the future supply of physicians and the future requirements for services. The Panel's solutions to resolve the aggregate oversupply and the specialty imbalances were to decrease the number of medical graduates, to restrict the entry of foreign medical graduates in the U.S., and to change the mix of residency positions.

The Panels on Nonphysician Providers and Geographic Distribution designed other solutions. Because it was found that the required number of physicians related inversely to the number of nonphysician health care providers when performing services traditionally provided by physicians, the Panel on Nonphysician Providers made a series of recommendations to solve this supply/requirements problem. The uneven geographic distribution of physicians and the lack of criteria for designating underserved populations were discovered as major problems in health manpower planning; therefore, the Geographic Distribution Panel invented new strategies to overcome these impediments to efficient health manpower deployment.

The Educational Environment and Financing Technical Panels also searched for creative solutions to specialty and location choice of physicians through mechanisms for intervention in the educational environment and/or through financial incentives. Strategies to affect specialty and location decisions of physicians may occur predominantly through financial incentives, but intervention through the educational institutions seems to provide another alternative.

The recommended strategies for financing were divided into five different categories, but concentrated on two: Financial incentives to doctors in training and to practicing physicians, and program development in the teaching institutions and in underserved areas.

Solutions to manpower problems were formulated by GMENAC in a series of 107 recommendations, which were approved with near unanimity in all cases. The verbatim recommendations are stated in the reports of the Technical Panels on Modeling Physician Supply and Requirements, on Geographic Distribution, on Finance, on the Educational Environment, and on Nonphysician Health Care Providers. (See GMENAC Report Volumes II, III, IV, V, and VI). The complete recommendations are also reported in Volume VII, the Appendix to the GMENAC Report. For this Summary, the 107 recommendations were condensed into 40 major and 25 supportive recommendations. A cross reference of the summary and verbatim recommendations is on the last page of this chapter. The recommendations are directed at solving the oversupply of physicians, the surpluses or shortages within individual specialties, and the uneven geographic distribution of physicians.

A. There Will be a Surplus of Physicians in 1990

GMENAC has concluded that in 1990 there will be 70,000 more physicians than required to provide physician services. (536,000 supply, 466,000 requirements, see Case 2 assumptions page 9). It must be cautioned that the mathematical models to estimate physician supply and requirements for 1990 have an uncertain range of error. The supply estimates for 1990 are likely to have a relatively smaller error than the requirements estimates. The designation of either surplus or shortage is believed by GMENAC to be correct; however, the magnitude of the surplus or the shortage is less certain. Some errors can be corrected in the coming year with an exacting review of the many volumes of data. Other errors will be discovered in the future as experience confirms or refutes the estimates. Meanwhile, GMENAC advises that the numerical size of the aggregate estimates for 1990 be considered tentative until the new methodology developed by GMENAC undergoes critical evaluation.

This estimated surplus of 70,000 physicians, even if the figure is too high by a third or a half, cannot be significantly corrected by 1990 due to the long lag time required to reduce the supply. It will be difficult to decrease enrollments in medical schools with the current influences favoring expansion or to restrict the entry of foreign medical graduates. To proceed toward correction GMENAC recommends that the number of medical students be decreased, that the entry of foreign medical graduates be curtailed, and that the appropriate number of nonphysician health care providers to be trained be reassessed. Although the number of medical students should be reduced, care should be taken to assure that programs to increase the representation of minority groups in medicine are not thwarted.

A particular concern is with the continued inflow to practice of U.S. citizens who have studied medicine outside the United States. This concern is stimulated by the recent development of many new medical schools outside the United States. GMENAC strongly urges that special attention be given by the Federal Government to adopting measures to reduce substantially this inflow.

Recommendation 1

Allopathic and osteopathic medical schools should reduce entering class size in the aggregate by a minimum of 10 percent by 1984 relative to the 1978–79 enrollment, or 17 percent relative to the 1980–81 entering class.

Supportive Recommendations:

a. No new allopathic or osteopathic medical schools should be established beyond those with first-year students in place in 1980–81.

b. No increase in the entering class size into allopathic and osteopathic medical schools beyond the entering class of 1981 should occur.

c. The current health professions law, The Health Professions Educational Assistance Act of 1976 (P.L. 94–484), which authorizes grants to health professions schools for construction of teaching facilities, should be amended to allow the Secretary of the Department of Health and Human Services to grant waivers immediately to allopathic and osteopathic medical schools to allow them to ignore the law's requirement to increase enrollment. This recommendation applies as well to the pertinent Veterans Administration authorities under the Manpower Grants Program.

d. The current health professions law should be amended to allow the Secretary of the Department of Health and Human Services to waive immediately the requirement that allopathic and osteopathic medical schools, as a condition of receiving a capitation grant, maintain the first-year enrollment at the level of the preceding school year. This recommendation applies as well to the pertinent Veterans Administration authorities under the Manpower Grants Program.

Recommendation 2

The number of graduates of foreign medical schools entering the U.S. yearly, estimated to be 4,100 by 1983, should be severely restricted. If this cannot be accomplished, the undesirable alternative is to decrease further the number of entrants to U.S. medical schools.

Supportive Recommendations:

a. All Federal and State assistance given through loans and scholarships to U.S. medical students initiating study abroad after the 1980–81 academic year should be terminated.

b. The current efforts in the private sector to develop and implement a uniform qualifying examination for U.S. citizens and aliens graduating from medical schools other than those approved by the Liaison Committee for Medical Education (LCME) as a condition for entry into Liaison Committee for Graduate Medical Education (LCGME)-approved graduate training programs should be supported. Such an examination must assure a standard of quality equivalent to the standard applied to

LCME-accredited medical schools. These U.S. citizens and aliens must be required to complete successfully Parts I and II of the National Board of Medical Examiners' examination or a comparable examination. The Educational Commission for Foreign Medical Graduates (ECFMG) examination should not be used as the basis for measurement of the competence of USFMGs or alien physicians.

c. Alien physicians, who enter the United States as spouses of U.S. citizens, should be required to complete successfully Parts I and II of the National Board of Medical Examiners' examination or a comparable examination prior to entry into residency training.

d. The ability to read, write, and speak English should remain a requirement for graduate medical education programs for all alien physicians.

e. The Federation of State Medical Boards should recommend and the States should require that all applicants successfully complete at least one year of a GME program that has been approved by the LCGME and successfully pass an examination prior to obtaining unrestricted licensure. The examination should assure a standard of quality in the ability to take medical histories, to do physical examinations, to carry out procedures, and to develop diagnostic and treatment plans for patients. The standard of quality should be equivalent to graduates of United States medical schools.

f. The States should severely restrict the number of individuals with limited licenses engaged in the practice of medicine. This restriction applies to those practicing independently without a full license and to those practicing within an institution without adequate supervision.

g. The "Fifth Pathway" for entrance to approved programs of graduate medical education should be eliminated.

h. The transfer of U.S. citizens enrolled in foreign schools into advanced standing in U.S. medical schools should be eliminated.

Recommendation 3

The need to train nonphysician health care providers at current levels should be studied in the perspective of the projected oversupply of physicians.

B. There will be Shortages in Some Specialties and Surpluses in Others in 1990

The mathematical models for estimating supply and requirements for 1990 have been applied to the specialties and the subspecialties. The difference between supply and requirements is the imbalance constituted by either a surplus or a shortage. The designation of either a surplus or a shortage for a given specialty or subspecialty is accurate, but the actual numbers could have a wide margin of error.

In modeling the pediatric subspecialties, the internal medicine subspecialties, and the surgical specialties, GMENAC assumed that these practices would become more specifically focused in their areas of expertise than present studies indicate. It was assumed that in their respective fields the pediatric and internal medicine subspecialists would continue to provide broad, comprehensive longitudinal care but to a limited selected patient population with major and complex disorders rather than to an unselected patient population. The net effect would be a practice enriched in the specialty but with less general or primary care. Similar reasoning was applied to the surgical specialties.

The consequence of this assumption is a decrease in the requirements for pediatric and internal medicine subspecialties and for surgical specialists, and an increase in the requirements for general pediatricians, general internists, family physicians, and general surgeons.

The estimated supply for 1990 of general pediatricians, general internists, and family physicians is nearly 200,000. This estimate includes allopathic family physicians and osteopathic physicians in general practice. Approximately 90 percent of all osteopathic physicians are in general practice. The surplus estimated in these three primary care disciplines combined is trivial in percentage (about 7 percent) and probably within the error ranges for the Models at this stage of development.

In view of the inevitable aggregate surplus of physicians in 1990, GMENAC recommends that the surplus be encouraged to enter the three primary care fields for training purposes once the shortages in other specialties have been corrected as much as possible. Therefore, although the Models estimate a small surplus in the three primary care disciplines, GMENAC recommends that a larger surplus be created deliberately in the 1980s as an interim measure until an aggregate balance can be achieved in the 1990s.

The increasing geriatric population has significant manpower implications for 1990. The fastest growing segment of the U.S. population is the group over age 65. This group numbered 13.6 million in 1953, 23.9 million in 1978, and is expected to reach 35 million in 2003. GMENAC did not address the need for physicians for this age group separately because geriatrics is not a certified specialty. The need of the elderly for services from each of the specialties (exceptions are pediatrics and obstetrics) has been addressed in the Requirements Model through the adjustment of incidence/prevalence rates of conditions for changes in the age distribution of the population. For example, the number of persons with arthritis, which is common in the elderly, received a substantial upward adjustment on the basis of the growth in the geriatric population. GMENAC assumed that the provision of services to the population over 65 will continue to be in the domain of general internists and family/general physicians.

The surpluses estimated for many specialties and subspecialties would be only partly corrected by 1990 even if residency training in those disciplines were completely discountinued. Such drastic action would be disruptive of the GME system because it would interfere with patient care in the teaching institutions. This action might also create imbalances in supply/requirements in the reverse direction for the future.

Recommendation 4

To correct shortages or surpluses in a manner not disruptive to the GME system, no specialty or subspecialty should be expected to increase or decrease the number of first-year trainees in residency or fellowship training programs more than 20 percent by 1986 compared to the 1979 figure.

Recommendation 5

In view of the aggregate surplus of physicians projected for 1990, medical school graduates in the 1980s should be strongly encouraged to enter those specialties where a shortage of physicians is expected (see Figure 1) or to enter trainihg and practice in general pediatrics, general internal medicine, and family practice.

C. The Requirements for Nonphysician Health Care Providers Should be Integrated Into Physician Manpower Planning

GMENAC concluded that nurse practitioners (NPs), physician assistants (PAs), and nurse-midwives (NMWs) make positive contributions to the health care system when working in close alliance with physicians. The Committee supports the practice of nonphysician providers under the supervision of physicians but does not endorse the concept of their practicing independently. Nonphysician providers can enhance patient access to services, decrease costs, and provide a broader range of services. Certain consumers prefer the nonphysician provider.

In circumstances when a complete medical visit is delegated to a nonphysician provider, the productivity of the practice can be increased, and the requirements for physicians can decrease. Thus there is a one-to-one equivalency between physicians and nonphysician providers for selected types of medical visits. Therefore, an inverse relationship exists between the number of physicians needed and the number of nonphysician providers needed to provide a fixed number of such selected types of medical visits. However, the relationship between the number of physicians required nationally and the number of nonphysician providers required is not fully represented by such a proportion since each provider type performs other unique services. These other services, beyond medical visits, help to define the numerical requirements for each provider type. A public policy dilemma occurs in an era of physician surplus because we do not know how simultaneously to preserve or extend the nonmedical services of nonphysician providers without simultaneously extending their contribution to the medical surplus. At the current rate of training NPs, PAs, and NMWs the supply will double by 1990. The approximate 20,000 nonphysician providers in 1978, and 40,000 in 1990, will add further to the surplus capability.

Extensive research is needed to determine the relative efficacy of medical services provided by nonphysicians and physicians. Although GMENAC has concentrated on NPs, PAs, and NMWs, in child, adult and obstetrical/gynecological care, in the future all other nonphysician health care providers should be studied and integrated into manpower planning. Other nonphysician providers include optometrists, clinical psychologists, psychiatric social workers, psychiatric nurse clinicians, podiatrists, and nonphysician providers for anesthesiology, emergency medicine, neurology, nuclear medicine, radiology, pathology, and preventive medicine. The research should include:

- The effect of a physician excess on nonphysician utilization.
- The specialty distribution of NPs and PAs in the various medical and surgical specialties.
- The geographic distribution of nonphysicians and their contribution to increased service accessibility, particularly in underserved areas.
- The relative costs and expenditures of using nonphysicians in place of physicians for selected medical care services, especially in underserved areas.
- The distinctive features, if any, of the care given by nonphysicians and the relationship to patient outcome.

- The upper limit of delegability in the various specialties.
- The comparative effects of task and whole visit delegation on the health services system.
- The efficiency and effectiveness of utilizing NPs and PAs in complementary roles as part of a team approach to health care (the physician and nonphysician provider).
- The optimal productivity of nonphysicians with respect to medical services, including differential productivity by provider type (PA or NP) and by specialty of practice.
- The limits and reasons of consumer preference for and acceptance of nonphysician providers.
- The minimal adequate physician supervision needed to assure quality of care provided by PAs and NPs.
- The optimal number of NPs and PAs that can be supervised by one physician.
- The content of care in nursing practice and its overlap with medicine in conditions seen, services given, outcomes, and legal responsibility.
- The professional longevity of nonphysician providers.
- The examination of the manner in which present reimbursement policies act to limit utilization of PAs, NPs, and NMWs, and the development of appropriate reforms.
- The health system effects, both negative and positive, of direct reimbursement to nurse-midwives.
- The factors which determine the extent of nurse-midwifery participation in clinical practice.
- The extent and nature of present PA involvement in surgical care and the potential for increased delegation in these specialties.
- The potential for full-visit delegation to PAs and NPs in dermatology.
- The distinction or similarity in services provided by psychiatrists and clinical psychologists, and by psychiatric social workers and psychiatric nurse clinicians with respect to the kinds of conditions seen, the interventions taken, and the outcomes.
- The nature and extent of overlap in the practices of podiatrists and dermatologists and podiatrists and orthopedic surgeons.
- The desirability and feasibility of using an ophthalmologist versus an optometrist for refractive eye care.
- The actual and potential roles of nonphysician providers in the following specialty areas: anesthesiology, emergency medicine, neurology, nuclear medicine, pathology, preventive medicine, and radiology.

Recommendation 6

Extensive research on the requirements for NPs, PAs, NMWs, and other nonphysician providers should be undertaken as soon as possible. Special attention must be given to the effect of a physician excess on their utilization and to the benefits these providers bring to health care delivery. These studies should consider the full range of complementary and substitute services.

Recommendation 7

Until the studies in Recommendation 6 have been completed, the number of PAs, NPs, and NMWs in training for child medical care, adult medical care, and obstetrical/gynecological care should remain stable at their present numbers. Delegation levels recommended by GMENAC for 1990 are: in obstetrics/gynecology 197,000 of the normal uncomplicated deliveries (5 percent of all deliveries), 7.1 million maternity related visits (20 percent of the obstetrical caseload), and 7.5 million gynecological visits (18 percent of the gynecological caseload); in child care not more than 46 million ambulatory visits (16 percent of the child ambulatory caseload); and in adult medical care not more than 128 million ambulatory visits (12 percent of the adult medical ambulatory caseload).

Recommendation 8

All incentives for increasing the class size or the number of optometric or podiatric schools should cease until the studies in recommendation 6 have been completed and evaluated.

D. The Laws, Regulations, and Programs Pertaining to Nurse Practitioners, Physician Assistants, and Nurse Midwives Should be Made More Consistent and Facilitative of Public Policy.

The State laws and regulations governing licensure of nonphysician providers including supervision by physicians, ability to write prescriptions, reimbursement for services, and services performed in medically underserved areas are inconsistent and often contrary to policy objectives. State regulation, which is relatively new, has been devised to meet local needs and to respond to local political processes. The variations and inconsistencies among the States seem to interfere with the Nation's objective to provide equal access to high quality health services for all Americans.

Recommendation 9

State laws and regulations should not impose requirements for physician supervision of NPs and PAs, beyond those needed to assure quality of care.

Supportive Recommendations:

a. State laws and regulations should be altered as necessary so that a PA or NP working under appropriate physician supervision can independently complete a patient encounter for conditions which are deemed delegable.

b. The States should provide PAs, NPs, and NMWs with limited power of prescription, taking necessary precaution to safeguard the quality of care including explicit protocols, formularies, and mechanisms for physician monitoring and supervision.

c. At a minimum, PAs, NPs, and NMWs should be given power to dispense drugs in those settings where not to do so would have an adverse effect on the patient's condition.

d. States, particularly those with underserved rural areas, should evaluate whether the laws and regulations pertaining to nonphysician practice discourage nonphysician location in these areas.

Recommendation 10

The requirements of third-party payors for physician supervision should be consistent with the laws and regulations governing nonphysician practice in the State.

Recommendation 11

Medicare-Medicaid, and other insurance programs, should recognize and provide reimbursement for the services by NPs, PAs, and NMWs in those States where they are legally entitled to provide these services. Services of these providers should be identified as such to third-party payors and reimbursement should be made to the employing institution or physician.

Recommendation 12

NPs, PAs, and NMWs should be eligible for all Federal incentive programs directed to improving the geographic accessibility of services, including the National Health Service Corps Scholarship Program.

Recommendation 13

Graduate medical education should be constructed to give residents experience in working with PAs, NPs, and NMWs to insure that these physicians will be prepared to utilize nonphysician services.

E. A More Appropriate Geographic Unit for Analysis in Health Manpower Planning Is Needed.

A major charge to GMENAC was to document the uneven geographic distribution of physicians and to make recommendations for improvement. The Report of the Panel on Geographic Distribution *(GMENAC Report,* Volume III) argues that the systems of data collection necessary for creditable geographic manpower planning do not exist. The Panel's findings reveal a wide variation in use rates for many medical services in different geographic areas and a general absence of studies on the efficacy of services provided. Agreed-upon standards for designating an area as adequately served or underserved have not been developed, thereby seriously impairing local, regional, and national health manpower planning. An appropriate geographic unit for analysis is needed.

GMENAC found that geopolitical boundaries such as States or counties are inadequate for analysis of medical services. The Committee advises that a smaller geographic unit within which the large majority of the residing population receives a specified health service be adopted. The geographic boundaries of these functional medical service area (FMSAs) would be different for each of five types of health service: emergency, obstetrical, child medical, adult medical, and general surgical. The precision of health manpower planning at the local level depends on the accuracy of identification of each of the boundaries. An accurate identification of the site where each person in the area receives different types of health services is essential.

Until functional medical service areas are identified and total enumeration of physician services is available, physician market areas by specialty should be determined empirically based on patient origin data derived from such information as discharge and claims data. The functional medical service areas should be compared to those previously determined by specialty societies. The specialties of dermatology, obstetrics/gynecology, orthopedics, and neurosurgery have developed methods for determining the market areas for their respective specialties based on zip codes, economic service areas, and time-to-service concepts.

Recommendation 14

GMENAC recommends that the basic unit for medical manpower planning should be a small geographic area within which most of the population receives a specified medical service. These functional medical service areas, service by service, are recommended as the geographic units for assessing the adequacy of manpower supply.

F. Variations in the Rates of Utilization of Health Services Among Different Geographic Areas is a Major Problem in Health Manpower Planning.

Substantial variations in per capita rates of utilization of both surgical and medical services in different geographic areas have been documented. The effect of this variation on the relative health status of the populations being served is uncertain. Clinical investigation of the efficacy of different diagnostic or therapeutic modalities must be undertaken. The investigations must involve large numbers of patients and physicians and include extensive experimental controls. Until these outcome studies have been accomplished, manpower planning will yield different requirements for physicians, depending on whether a low utilization model or a high utilization model is used.

Recommendation 15

GMENAC encourages the support of efforts within the profession to assess the outcomes of common medical and surgical practices exhibiting high variation across communities. Accomplishing this step would help to establish long-range requirements for physician services in the United States.

Recommendation 16

Variations between communities in the utilization of specific medical services should be continuously documented and analyzed. The effect of differing financing and organizational arrangements for the delivery of medical care services should be evaluated.

Supportive Recommendations:

a. Utilization rate experiences, relative to the norms of other physicians practicing in the immediate area, the region, or the Nation, should be made available to physicians.

b. Future health manpower planning groups should compare manpower estimates, whether derived from "need-based" or "requirements-based" models, against empirical estimates selected from areas in the United States exhibiting high and low utilization patterns.

G. Standards for Designation of Areas as Adequately Served or Underserved Should be Developed.

Many Federal and State legislative programs to improve access to medical services depend upon a designation of "underserved" for a given area. GMENAC recommends that functional medical service areas (FMSAs) be adopted as the smallest geographic unit for analysis and that minimum specialty-specific physician-to-population ratios and maximum travel-times-to-service be adopted as standards.

Recommendation 17

GMENAC recommends that health manpower shortage areas be defined by a minimum service-specific physician-to-population ratio and a maximum travel-time-to-service for child care, adult medical care, obstetrical services, general surgical services, and emergency medical services.

Supportive Recommendations:

a. The minimum acceptable physician-to-population ratio for any area in the U.S. should be 50 percent of the requirements estimated by GMENAC for each type of health service in the Nation as a whole.

b. Maximum travel times to service for 95 percent of the population within a geographic area should be 30 minutes for child care, adult medical care, and emergency medical service; 45 minutes for obstetrical care, and 90 minutes for general surgical services.

H. Mechanisms to Achieve a More Favorable Geographic Distribution of Physicians are Needed.

Recommendations to improve the geographic distribution of physicians are central to GMENAC's charter. The Committee's recommendations can be sorted into five categories: data to monitor the geographic distribution of physicians, programs directed at medical students, initiatives during the graduate medical education phase of training, wide area health service and education programs, and the need for further research.

- Financial factors determining geographic distribution of physicians to be researched and evaluated include: the perception of relative income levels as a motivating force in location and specialty choice; the use of tax credits or deductions as incentives in location choice, and several modified reimbursement schedules. Reimbursement schedules that should be examined are: Higher payment levels in underserved areas, discontinuation of geographic differentials in payment levels, equal payment for primary care services whether provided by generalists or by specialists, and differential rates of payment for technology-intensive procedures versus time-intensive counseling and patient education services.

- The educational factors to be resolved include: The ethnic and sociodemographic characteristics of the students selected for admission to medical school and the effect of student and resident preceptorships in underserved areas.

• Factors relating to practice to be studied include: The decisive factors in the physician's decision to practice in an underserved area; the effectiveness of the Rural Health Initiative, Rural Health Clinics, and the Health Underserved Rural Area Programs; and the potential effectiveness of establishing group practice arrangements with appropriate communication and transportation networks as a means of attracting physicians to rural communities.

Recommendation 18

Alternative data systems for monitoring the geographic distribution of physicians should be developed and evaluated.

Recommendation 19

Medical students should be encouraged to select a location for practice in underserved rural and urban areas by several approaches: (1) urban and rural preceptorships should be continued and expanded by those schools having an interest, (2) governmental loan and scholarship programs should be catalogued and evaluated to determine their effectiveness in improving geographic distribution, (3) loan forgiveness programs modeled after those which have been successful should be used, and (4) the National Health Service Corps and its scholarship program should be supported.

Recommendation 20

The medical profession in making decisions as to residency training programs should consider the aggregate number of programs, their size, and the geographic distribution of their graduates, in addition to the quality of the program, in light of national and regional needs.

Recommendation 21

Family practice residency training programs should be supported since these programs tend to train providers who are more likely to choose to practice in underserved areas. A similar rationale underlies support needed for resident experiences in underserved areas and for certain nonphysician provider training programs.

Recommendation 22

Area-wide programs of decentralized medical education and service such as WAMI (Washington, Alaska, Montana, and Idaho), WICHE (Western Interstate Commission for Higher Education), and some AHECs (Area Health Education Centers) should be evaluated for replicability. Such programs have been effective in placement of physicians in sparsely populated areas.

Recommendation 23

More research and evaluation should be conducted on factors relating to the geographic distribution of physicians.

I. The Role of the Medical School and Teaching Hospital in Specialty and Geographic Distribution Should be Examined.

The Committee concluded that medical schools and teaching hospitals can contribute to a larger and more coordinated effort to modify the specialty and geographic distribution of physicians. Isolated initiatives within these institutions alone are not likely to be effective. The myriad factors, different for each person, that influence specialty choice are experienced by the physician-to-be from early life until the actual decision. Within this lengthy decision-making process, the medical education environment can have an influential but not necessarily a dominant role.

Recommendation 24

Medical education in the medical schools and in the early phase of graduate medical education in the teaching hospitals should provide a broad-based clinical experience with emphasis on the generalist clinical fields. A portion of graduate medical training should occur in other than tertiary care medical centers.

Recommendation 25

A more vigorous and imaginative emphasis should be placed on ambulatory care training experiences.

Supportive Recommendations:

a. The out-patient services of the academic medical centers should be upgraded through special project grants.

b. Educational innovation in out-patient settings should be fostered by providing financial support.

c. Faculty should be encouraged and supported to develop careers focused on ambulatory medicine through a career development award mechanism.

Recommendation 26

Greater diversity among the medical students should be accomplished by promoting more flexibility in the requirements for admission; by broadening the characteristics of the applicant pool with respect to socioeconomic status, age, sex, and race; by providing loans and scholarships to help achieve the goals; and by emphasizing, as role models, women and under-represented minority faculty members.

Recommendation 27

Information about physician manpower needs in the various specialties and in different geographic settings should be disseminated broadly to medical schools; administrators; faculty; and medical students, residents, fellows, and spouses.

J. Financing Mechanisms at the Level of Undergraduate Medical Education, Graduate Medical Education, and Reimbursement for Physician Services Should be Reviewed.

The Committee concluded that alterations in methods of financing undergraduate and graduate medical education and changes in the system of reimbursement for medical services offer valid mechanisms for influencing the specialty and geographic distribution of physicians. In the short term, financial incentives at the undergraduate and graduate medical education levels have the greater potential to effect change than modifications of the reimbursement system for medical services.

Recommendation 28

Capitation payments to medical schools for the sole purpose of increasing class size or for influencing specialty choice should be discontinued in view of the impending surplus of physicians.

Recommendation 29

Special purpose grants to medical schools and other teaching institutions for primary care training in family medicine, general internal medicine, and general pediatrics should be continued in order to increase the emphasis on primary care services and ambulatory care.

Supportive Recommendations:

a. Family practice programs, at least for the near term, should be given special attention in view of the difficulty in financing training programs from ambulatory care revenues.

b. Specialties in short supply should be considered for special project grants.

Recommendation 30

Ambulatory care training should be promoted further by the provision of grants for renovation and construction of facilities, for the support of training programs in ambulatory sites, and for student preceptorships and residency experiences in out-of-hospital care.

Recommendation 31

The medical profession, having the major responsibility for correcting physician oversupply, should ensure the quality of all graduate medical education programs and full funding of these programs through reimbursement should be given only to accredited programs when mechanisms are in place.

Recommendation 32

Calculations of the true costs of graduate medical education should include the compensation for residents and teaching personnel and all of the ancillary and indirect costs, and should distinguish between the cost of education and the cost of patient care by a uniform recognized reporting system. Costs should be borne equitably by all payors as part of the normal rate structure for patient care costs at the teaching hospitals, clinics, and other sites where health services and training are provided, to the extent that such costs are not financed by tuition, grants, or other sources of revenue.

Recommendation 33

The health professions should assume a major responsibility for cost containment in new program development, in accreditation and certification, and in the provision of health services.

Recommendation 34

Public and private reimbursement policies should be adjusted to: emphasize ambulatory care services and training; encourage practice in underserved areas; explore the concept of shared risk among physicians; and pay professional fees to teaching physicians when their services have been identifiably discrete and necessary.

Recommendation 35

Continuous monitoring and evaluation of existing and new financial programs should be supported. Actions undertaken to alter financing and reimbursement strategies should not be advanced as permanent mechanisms for change until adequate evaluation/demonstration efforts have been performed.

K. Other Initiatives Related to Financing

Research is needed to clarify the relationship between financial considerations and a variety of topics central to health manpower planning. The research should include:

- The effect of different health care financing plans on the specialty distribution of residency positions.
- The effect of different health care financing plans on public versus private training institutions.
- The impact of distributing data on community-wide fees and payment practices on a specialty and condition-specific basis.
- The relationship between medical student indebtedness and specialty and location choice.
- The effect of directly reimbursing nonphysician providers on an independent free-standing basis.

Recommendation 36

Additional research should be accomplished on a broad array of topics related to financial considerations.

Recommendation 37

Special project grants for States on a cost-sharing basis should be considered to influence the geographic distribution of physicians within the States. The development of incentives for practice in underserved areas is one program to be considered.

Recommendation 38

The development of future medical faculty, administrators, and researchers should be assured by provision of adequate financial support for their training.

L. Recommendation to Continue the Activities of the Graduate Medical Education National Advisory Committee

The Committee believes that health manpower planning is best advanced through a continuous collaboration between the health professions and the Government. The workplan of the future should include:

- Complete the requirements estimates for anesthesiology, neurology, physical medicine and rehabilitation, pathology, radiology, and nuclear medicine.
- Promote discussion, criticism, and acceptance of the GMENAC Report among professional groups, governmental bodies, medical schools, teaching hospitals, and consumer groups.
- Respond to suggestions and criticisms from interested groups or individuals.
- Assess and improve the modeling methodology for long-term usage.
- Identify future data needs and implement processes for obtaining data.
- Monitor and reassess the GMENAC supply/requirements estimates and recommendations.
- Initiate studies or collaborate with other study efforts, to estimate manpower needs for academic medicine, correctional institutions, mental health facilities, Indian reservations, the Department of Defense, and the Veterans Administration.
- Initiate a long-term program to integrate physician manpower planning with planning for nurse practitioners, physician assistants, nurse midwives, podiatrists, optometrists, psychologists, psychiatric nurse clinicians, and psychiatric social workers.
- Advocate research on the relationship of financial motivating forces, including reimbursement plans, to physician specialty choice and practice characteristics.
- Establish functional medical service areas as the geographic unit within which a minimum physician-to-population ratio and maximum travel time to service can be established as standards for measuring the adequacy of medical services.
- Initiate studies to assess the special manpower needs related to the geriatric population, the most rapidly growing age group in the U.S.

Recommendation 39

A successor to the Graduate Medical Education National Advisory Committee should be established by statute. This successor should be an advisory body without regulatory functions.

Recommendation 40

In addition to the continuous monitoring, the supply projections, requirements estimates, and recommendations of GMENAC in their entirety must be reevaluated and modified at least every five years to take account of changes in data, assumptions, and priorities occurring over time.

Cross-Reference of GMENAC Recommendations

GMENAC Summary Recommendations (VOL I)	GMENAC Panel Recommendations				
	Modeling (VOL II)	Nonphysician Providers (VOL VI)	Geographic Distribution (VOL III)	Educational Environment (VOL V)	Financing (VOL IV)
1	3				
1a–1d	1,2,4,5				
2	6				
2a–2h	7–14				
3	15	17			
4	17				
5	16				
6		1,12,20–24			
7		2–11			
8		20–23			
9		13			
9a–9d		13a–13d			
10		15			
11		14			
12		18			
13		16			
14			1,3		
15			7		
16			4,6		
16a–16b			5,6		
17			11		
17a–17b			9–10		
18			2,12,13		
19			18,24,25,27		8
20			23		
21			19,20,21		
22			22,26		
23			14–17,28–31		
24				4,5,6	
25				4	21
25a–25c				4	
26				1,2,3,8,9	7
27				7	
28					1,2
29					3,4
29a–29b					4
30					5,6
31					11
32					12,13,14
33					15,16
34					18,19,20
35					24
36					9,23
37					22
38					17
39[1]					
40[1]					

[1] *In Summary Report only.*

A. Federal Government and Private Commission Initiatives: (1955–1980)

While the period from 1954 to 1965 can be characterized as the Era for Support of Biomedical Research, the period from 1955 to 1980 can be termed the Era of Debate and Funding for Health Manpower. The research era reflected the confidence in science influenced by the mastery of atomic fission and outer space travel. It was in this period that specialization in medical training and practice increased.

The Health Manpower Era was an outgrowth of the Civil Rights Movement of the 1950s. The historic *Brown* v. *Board of Education* decision promising equal opportunity led to a national concept of fundamental rights as specific entitlements in health care as in other areas. From the concept of civil rights emanated a series of Federal health care initiatives. The "Kerr-Mills Act," the Public Welfare Amendments of 1962 (P.L. 87-543) provided funds for the care of the indigent aged. The Health Professions Educational Assistance Act of 1963 (P.L. 88-129) provided construction funds and capitation grants to enlarge the class size in the medical schools. Amendments to P.L. 88-129 in 1965 (P.L. 89-290) supported operating costs of the medical schools and created medical scholarships. The capstone of the concept of rights as specific entitlements in health was the Medicare and Medicaid legislation of 1965, the Social Security Act, Titles XVIII and XIX (P.L. 89-97), which provided funds for the health care of the aged and the poor. The concept of equal access to high quality health care at an affordable cost as a basic right of citizenship was implicit.

Federal legislation was designed to correct the perceived impediments to the achievement of these new national health care objectives. The major impediments were threefold: (1) an insufficient number of generalist physicians and allied health personnel, (2) a disproportionately large number of specialists relative to generalists, and (3) an uneven geographic distribution of physicians and facilities.

To correct these problems, the Health Manpower Act of 1968 (P.L. 90-490) authorized construction funds for medical schools to increase their enrollments. The Comprehensive Health Manpower Training Act of 1971 (P.L. 92-157) authorized capitation grants to increase medical school enrollment, to provide funds for the development of departments of family practice, and to increase the numbers of nonphysician health care providers. The Health Professions Educational Assistance Act of 1976 (P.L. 94-484) explicitly declared policy related to an increase in primary care physicians.

The Congress finds and declares that—the availability of high quality health care to all Americans is a national goal; the availability of high quality health care is, to a substantial extent, dependent upon—the availability of qualified health professions personnel; and . . . adequate numbers of physicians engaged in the delivery of primary care . . . The Congress further finds and declares—that health professions personnel are a national health resource and the Federal Government shares the responsibility of assuring that such qualified personnel are available to meet the health care needs of the American people.

This Act funded primary care training in family medicine, internal medicine, and pediatrics. Financial incentives, loans, and scholarships were made available to increase physician supply in underserved geographic areas.

These Federal programs were successful in their limited purposes. Until GMENAC, however, the programs were conceived without the benefit of an integrated, long-range health manpower plan. The result, too often, was that a solution to a problem bred a new problem.

During this same period from 1955–1980, private foundations and medical associations paralleled the Federal effort in health manpower planning and undertook several comprehensive reports on health manpower:

(1) The Bane Report of the Surgeon General's Consultant Group on Medical Education, *Physicians for a Growing America* (1959).

(2) The L.T. Coggeshall Report to the Association of American Medical Colleges, *Planning for Medical Progress through Education* (1965).

(3) The J.S. Millis Report to the American Medical Association, *The Graduate Education of Physicians: Report of the Citizens Commission on Graduate Medical Education* (1966).

(4) The Carnegie Commission Reports, *Higher Education and the Nation's Health Policies for Medical and Dental Education* (1970) and *Progress and Problems in Medical and Dental Education—Federal Support Versus Federal Control* (1976).

(5) The Macy Foundation Reports, *Physicians for the Future* (1976) and *Graduate Medical Education, Present and Prospective, A Call for Action* (in process, 1980).

(6) The Institute of Medicine Report, *A Manpower Policy for Primary Health Care* (1978).

(7) The American Medical Association Report, *Physician Manpower and Medical Education, II* (1978).

(8) The Association of American Medical Colleges Report, *Graduate Medical Education: Proposals for the Eighties* (1980).

(9) The Kellogg Foundation Report (in process, 1980) on graduate professional education in allopathic and osteopathic medicine and dentistry.

These commission reports made substantial contributions and called for more coordination and coherency in planning for health manpower. The commissions stressed the need for emphasis on generalist education and training, but the reports were limited by restricted data bases and the absence of a sophisticated methodology for making long range estimates of physician supply and health services requirements. The commission members frequently received data from governmental representatives, but a health profession and Government partnership was not intended and did not materialize.

During the Health Manpower Era, major changes occurred in the health care system, which suggested that neither the Government nor the profession should pursue national health objectives in isolation. Medical schools and the number of residencies, which more than doubled in size, were funded by the Government. The increase in medical school enrollment was largely supported by State tax dollars distributed to the State medical schools. Funds from Medicare-Medicaid and the Veterans Administration became the dominant sources for support of graduate medical education; therefore, collaboration between the Government and the health professions was needed for health manpower planning.

During the debates on the Health Professions Educational Assistance Act of 1976, the Congress considered but rejected a regulatory approach to the specialty distribution of residency training positions. In its view, however, evidence pointed toward an immediate shortage of primary care physicians and Congress enacted Public Law 94-484 which required medical schools, as a condition for receiving general support funds, to have 50 percent of first year residency positions in the primary care specialties.

The complexity of the issues and the general inadequacy of the data bases were recognized by all parties to the debate. In this climate, the necessity for GMENAC was recognized and its Charter was signed by the Secretary of DHEW (now, Department of Health and Human Services—DHHS).

B. GMENAC Approach: 1977-1980

A new comprehensive approach to health manpower planning, GMENAC is an advisory body to DHHS without regulatory powers.

GMENAC was charged in 1976, began its work in 1977, published an *Interim Report* in 1979, and culminated its activities in September of 1980.

GMENAC chose the target date of 1990 as the planning horizon because it is the earliest time a significant change can be effected. By 1990, 20 percent of the current supply of active physicians, (excluding residents) will retire, and 40 percent of the physician supply will have been trained since 1978.

The identification of the target dates of 1990 to 2000 had complex and significant manpower implications. The problems in the health care system identified in the latter half of the Sixties and the first half of the Seventies resolve by 1990. The severest problem, the insufficient numbers of physicians, reverses by 1990 and becomes a serious oversupply by the year 2000. The suboptimal availability of health services in 1965 in some geographic areas showed signs of amelioration by the late Seventies and is projected to vanish as a problem in the Nineties. The aggregate yearly rise in health care costs, characteristic of the Seventies, could become a phenomenon of the past. It is estimated that by 1990, a large segment of the population will receive medical care in new health service arrangements with financing plans that reduce costs. In its approach, therefore, GMENAC cautioned against making sudden and large shifts in programs without reassessment as a continuous process.

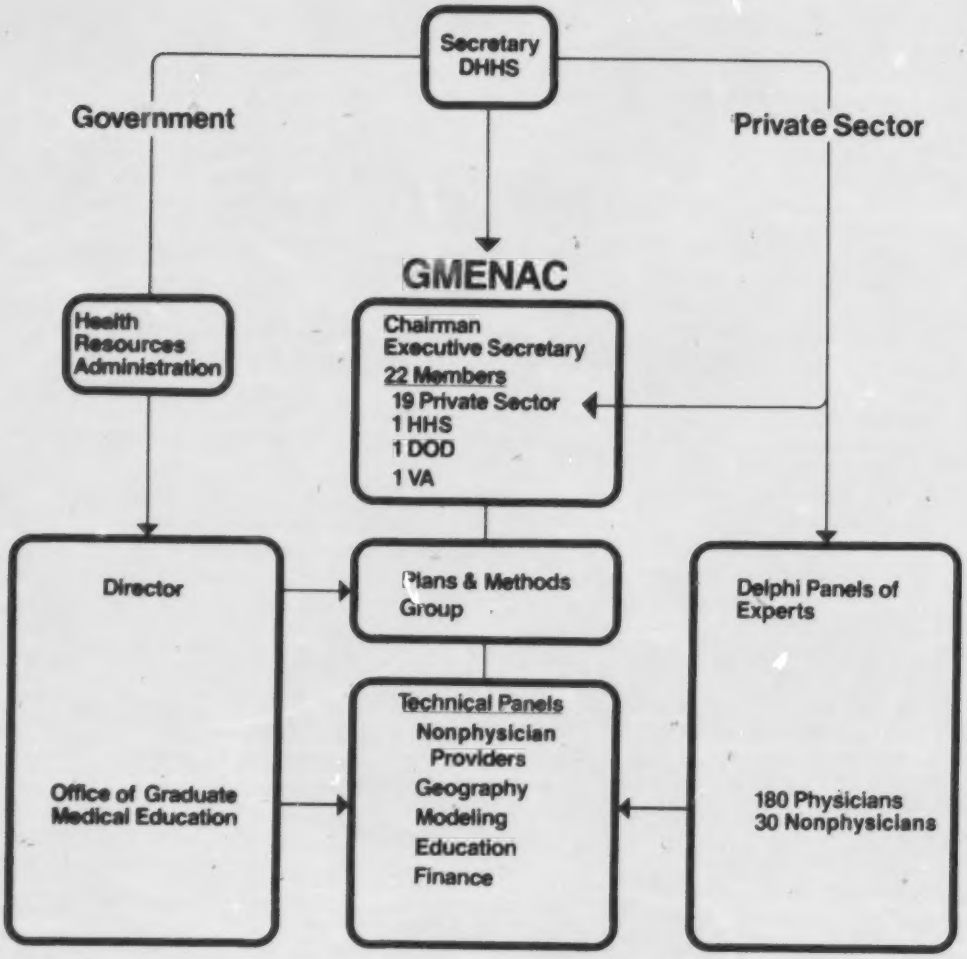
The Committee invested heavily in dissecting the intricacies of the pluralistic health care system. Despite a wealth of data from DHEW and from other governmental and private sources, GMENAC concluded that the available data bases on physician residency training programs and their relationship to what doctors do in their practices were inadequate for public policy analyses. Data relating training and practice content on a disease-specified basis to the incidence/prevalence of specific diseases had not been developed. Reliable data on physician supply and disease prevalence/incidence were available but were not linked through a data system. Supply and requirements forecasting methodologies were developed but applied on a very limited scale and never examined by public bodies for their utility in graduate medical education analysis. Prior to GMENAC, the data were not examined from the viewpoint of recommending actions to bring about an equilibrium between physician supply and requirements, by specialty and in the aggregate.

Because of inadequate data and limited methodology, the Committee directed its analyses along three major thrusts: (1) the refinement of data, (2) the modification and development of new approaches or models for forecasting future physician supply and physician requirements, and (3) the constitution of Technical Panels to study the determinants of specialty and geographic distribution.

In its attempt to refine the data bases, the Committee examined and compiled the best information obtainable from various secondary sources on students, interns, residents, and practitioners in both osteopathic and allopathic medicine. The Committee collected and organized all available data on physician supply, supply projections, and requirements estimates. It analyzed such data and carefully examined all models for projecting physician supply and requirements. The Committee conducted extensive literature reviews to assess the potential impact of nonphysicians on the need for physicians and to examine the current financing of GME and the relationship between physician income and specialty and location choice. Two other literature reviews were conducted to analyze the research on geographic distribution and on factors in the education environment that might influence manpower concerns.

GMENAC's second strategy for analysis was modeling for physician supply and requirements. After carefully considering the two modeling methods, a demand-based approach and a need-based model, the Committee designed an adjusted need-based model to project future physician requirements. A demand-based approach based on current utilization rates could perpetuate the inequities of the present system and create a shortage of physicians and possible cost inflation in the future if national health insurance is enacted. On the other hand, a need-based approach, based on the assumption of providing full services to the entire population, runs the risk of projecting physician requirements beyond what consumers are willing to purchase, thereby creating a surplus of physicians. Faced with the limitations of existing methods of forecasting requirements and the need to respond to diverse policy issues, GMENAC developed an adjusted need-based approach in which requirements are adjusted to account for the proportion of persons in each category of medical condtion likely to seek physician services. This Physician Requirements Model is a new methodology for health manpower planning. (See Section VI).

Figure 3


Secretary DHHS
Government
Private Sector
GMENAC
Health Resources Administration
Chairman
Executive Secretary
22 Members
19 Private Sector
1 HHS
1 DOD
1 VA
Director
Office of Graduate Medical Education
Plans & Methods Group
Technical Panels
Nonphysician Providers
Geography
Modeling
Education
Finance
Delphi Panels of Experts
180 Physicians
30 Nonphysicians

The Physician Requirements Model uses a separate modeling program for each of the 22 major specialty groupings within which there are 16 subspecialties. The specialty groups correspond to the organizational structure within the majority of training institutions in the U.S., which includes departmental status for certain disciplines such as medicine or surgery and divisions within departments for certain disciplines such as gastroenterology or thoracic surgery. The specialties conform to the major specialty certification boards. The specialties selected for modeling also conform to the decision points within the system of graduate medical education where changes in the mix of residency positions might be influenced. The Model tested first in obstetrics/gynecology was extended to the remaining clinical specialties, and modified models were developed for the nonclinical specialties.

Delphi Panels of Experts, approximately 180 physicians from the various specialties and thirty nonphysician health care providers, were appointed by GMENAC to provide expert judgment to the Technical Panel on Modeling Physician Supply and Requirements. These experts provided revised data on the incidence/prevalence of disease, on the norms of care, and on physician productivity in each specialty for the mathematical model.

The Technical Panel on Modeling and the Delphi Experts estimated physician supply and requirements with added assistance from four other Technical Panels on health manpower determinants. These Technical Panels concentrated upon topics that had a significant impact on planning: (1) financing of GME, (2) nonphysician health care providers, (3) the geographic distribution of physicians, and (4) the influence of the education environment. (See Section VII).

The Committee structured its workplan into an organization combining individuals from the private and the Government sectors. (See Figure 3). Members of GMENAC from the private sector included physicians, nurses, hospital administrators, insurance company executives, attorneys, and a health economist. The medical specialty societies, many physicians, and other health care providers participated significantly as special consultants through the modified Delphi process and through plenary sessions.

Members of GMENAC from the Government sector included the Administrator of the Health Resources Administration and a representative each from the Veterans Administration and from the Department of Defense.

Appointed by the Administrator of the Health Resources Administration, the Executive Secretary of GMENAC and the Director of the newly established Office of Graduate Medicine Education, a health statistician, were full time staff persons of GMENAC. The 15 professionals from that office, statisticians, epidemiologists, and economists, were integral members of GMENAC.

The Chairman and other GMENAC members were appointed by the Secretary of DHHS. The Committee met monthly or bimonthly in public plenary session. The 22 members of the Committee were assigned to one or more of the Technical Panels by the Chairman of GMENAC. The Technical Panels conducted their work in separate meetings and provided frequent reports to the full GMENAC Committee.

The workplan for GMENAC was coordinated by the Plans and Methods Group, which provided guidance on the process and integrated the components of GMENAC. Its members were the five Chairmen of the Technical Panels, the first Chairman of GMENAC, the present Chairman of GMENAC, who chaired the group, the Executive Secretary of GMENAC, and the Director of the Office of Graduate Medical Education. The Plans and Methods group met approximately six times each year.

To assure a unified approach, most GMENAC members served on two or more Technical Panels, and most staff served on more than one Technical Panel. Frequently, members of one Panel were invited to meet with or to make a presentation before another Panel. Although each Technical Panel had a separate charge, each component was ultimately integrated into a cohesive whole. The concepts under development by each Panel were frequently brought to the full GMENAC Committee, both in written form and at the monthly plenary sessions where they were discussed, criticized, and modified publicly with the participation of medical organizations and Government professionals. The Panels made recommendations to the full Committee of GMENAC. Each recommendation was approved with unanimity, or near unanimity, by the GMENAC Committee. (See Section IV).

C. Approach to Health Manpower Problems: 1990 and Beyond

GMENAC is confident that the objectives stated in the Charter can be attained. The discovery of many problems in the intelligence component of health manpower planning is a significant contribution of GMENAC in advancing the state of knowledge on planning for the future. The informational, methodological, and conceptual limitations of GMENAC (1980) can be changed by 1990.

More accurate and complete information needs to be made available for the Supply and Requirements Models. For the Supply Model, accurate information is needed on the numbers of filled residencies and fellowship positions in each year of training in each medical specialty. The number of alien and U.S. citizen graduates of foreign medical schools entering graduate medical education or practicing in the U.S. must be corrected. The AMA physician masterfile, a useful tool for data on practicing physicians, should accurately include the specialty of training, the dominant specialty of practice, and the age of all practicing physicians in the U.S.

Refinement of data for the Requirements Model is also essential for the future. The crucial need for this Model is accurate data on incidence/prevalence of most medical conditions and procedures, on the norms of care, and on the productivity of health service personnel. Data on the norms of care and the productivity of health service personnel must be collected and monitored continuously. Both will undergo modification because of technological advancements in diagnosis and treatment and changes in the health care structure. Such changes may lead to the diminished use of

hospitals and the greater use of non-hospital treatment centers, such as ambulatory care offices, day treatment centers, minimal care facilities, nursing homes, and hospices. Modification might also result from the imposition of financial restraints or incentives. Current figures on incidence/prevalence, norms of care, and productivity have to be estimated for the 1990s and beyond.

The methodology introduced in the Requirements Model is thought to be an extraordinarily effective instrument for planning. Undoubtedly, with added experience, the Requirements Model can be refined for greater efficiency. For this study, GMENAC processed hundreds of conditions through the Model for each specialty. For future use increased efficiency is possible by the identification of selected indicator health conditions in each specialty from which the entire requirements can be calculated.

Several important conceptual advancements in manpower planning for 1990 and beyond have been made by GMENAC in the areas of nonphysician providers, geography, education and financing. The GMENAC study underscored the inverse relationship between the number of nonphysician health care providers and the number of physicians needed for medical care visits. The professions that comprise the nonphysician providers should be studied in some coherent pattern and the criteria for allocating shares of service should be based upon newly collected information on the outcomes of care by different providers, on the relative cost-benefit assessments, and on client preferences. Planning in the years to come will figure the number of nonphysician providers more prominently in determining the supply and requirements for physicians. (See Section VII, B).

In the past, counties and other geopolitical boundaries were the units used to measure geographic distribution of physicians. Counties are not valid geographic units for measuring health services because they do not circumscribe medical market areas. Large numbers of residents of one county might receive health services in another. The use of physician-to-population ratios in large geographic areas is not relevant to the adequacy of service in smaller units within. A different standardized unit of measure based on local demography, customs, and health service utilization patterns is needed.

In the future, the newly conceptualized functional medical service area (FMSA) can be used for assessing adequacy of service. An FMSA is an area within which the majority of the population receives a specific specialty service. The area differs for each type of medical service. For example, the FMSA would be smaller for primary care by family/general physicians and general internists than the FMSA for a neurosurgeon who can serve a larger segment of the population over a wider geographic area. The FMSA has the potential of ameliorating this troublesome problem for local and regional planners. (See Section VII, C).

Emerging possibilities to achieve manpower goals within the educational environment might be simpler in the future than the present research indicates. The 140 medical schools and the 1,700 teaching hospitals will continue to provide quality medical education for the future. Medical schools and teaching hospitals should examine national, regional, and local needs, and adjust the curriculum accordingly. Broad-

based undergraduate medical education should include educational experience during years three and four focused upon general medical and ambulatory care. Graduate training should include opportunities for supervised educational experiences in the community. The admission pool for medical schools has the potential to become more socioeconomically, racially, culturally, and intellectually diverse.

The expanded definition of medical education, a chronological continuum spanning a period from pre-medical school to post-residency training, necessitates new and further research to identify choice points where different strategies might achieve specialty, geographic, and practice choice. Intervention in the education environment to affect manpower changes is problematic but possible when combined with other alternative approaches, particularly financing incentives. (See Section VII, D).

Programs for financing the provision of health services to effect long term future goals must be planned within a framework that considers the inseparability of financing undergraduate and graduate medical education, the practicing physicians, and the medical institutions. Manipulation of financial incentives to students and residents is a commonly suggested and effective practice for modifying physician specialty, but if not structured into a comprehensive overview can create significant imbalances. The professional fee reimbursement schedules for practicing physicians should continue to be assessed. Present research shows a low correlation between the level of physician fees and the choice about specialty and practice habits, but some GMENAC members believed initially, and many economists still agree, that a correlation between specialty choice and reimbursement does exist. Manpower planning enterprises should insist on a credible resolution to this question, and if indicated, an appropriate modification.

Future funding of institutions should insure the stable development rather than the erratic introduction and abrupt cessation of programs. Reliable funding promotes self-determinism of an institution, which in turn enhances program innovation and enriches diversity among institutions. The options for financing are multiple and influential in effecting manpower goals. Whatever financial incentives are utilized, a complementary rather than a conflictual relationship between financial and educational policies will insure quality health care for the future. Cost containment should not be allowed to erode quality. (See Section VII, E).

The achievement of a better distribution of physicians by specialty and by geography will not be accomplished by a single set of recommendations developed at any one point in time. Inaccuracies in the starting data bases, unanticipated changes in technology, uneven progress toward a system of national health insurance, and unforeseen changes in the specific ways in which medical and surgical conditions are treated, recommend a continuous process of monitoring and modifying health manpower supply and requirements in the future. A long-term comprehensive and integrated approach to health manpower planning needs the input of governments and health professions, for what each does best, and a collaboration between the two sectors for the development and pursuit of agreed upon objectives and programs to achieve them. The demonstration of the effectiveness of such collaboration, as limited and brief as it was, was a major accomplishment of GMENAC.

A. Introduction to Technical Panel on Modeling Physician Supply and Requirements

1. Members

Membership of the Panel on Modeling Physician Supply and Requirements changed as the terms of some members expired. The convener of the Panel, during the first phase of its work, was an academic surgeon with significant experience in medical manpower planning. The second convener was a pathologist who held an administrative position in the Veterans Administration. The third convener was an orthopedic surgeon at a university hospital. Other members of the Panel included: A pediatrician from an academic medical center, a psychiatrist, a urologic surgeon, a physician president of a large urban medical center, and a family physician, who directs a family practice residency training program. Three consulting groups, under contract, developed the two components of the Supply Model, the specialty-specific Supply Projection Model and the GME Model.

2. Charge

The central charge of the Panel was to develop a mathematical model or series of models for the estimation of physician supply and the estimation of physician requirements by specialty for the U.S. population in future years. The models were to specify the changes needed in the number of residents in each of the 22 specialties to achieve a supply-requirements equilibrium for future years. A second charge was to develop a strategy for long-term monitoring of progress toward achieving the equilibrium and a process whereby corrective steps could be recommended to achieve the desired balance.

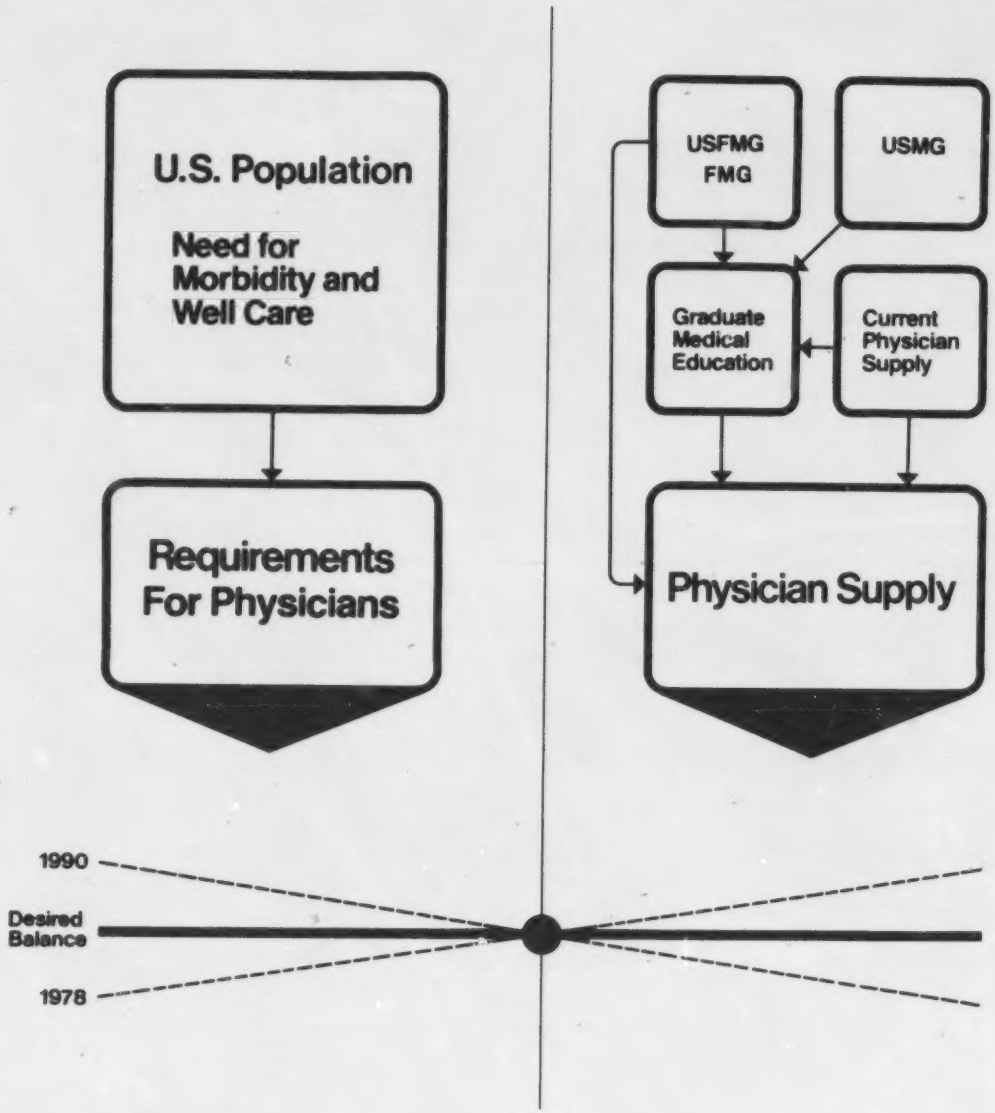
3. Accomplishments

The Panel developed and applied three mathematical Models for estimating physician supply and requirements for 1990, specified the variances from equilibrium between supply and requirements in each of the 22 specialties, and made recommendations toward achieving equilibrium. (See Figure 4).

a. The Supply Model projects for a future year the numbers of physicians in the aggregate or in each specialty. The Model adjusts numbers on present supply, U.S. medical school graduates, foreign medical graduates, and residents in training, for switching specialties during GME or later, and for death, disability, and retirement. This Model is more precise than other supply models because the data bases and assumptions that support it are significantly improved. Future projections of the Model incorporate policy changes that are designed to encourage future supply in the directions assumed in the Model. (See Section VI B).

b. The GME Model is based on the actual pathways through graduate medical education and into practice of more than 100,000 medical school graduates from 1960 to 1975. The GME Model draws on the distribution of medical school graduates across all of the first year positions in graduate medical education and also includes all of the branching and switching that actually occurs during GME. Previous models were limited to estimates of aggregate supply or to grouped specialties and did not take into account such branching and switching. It should be noted that the Model is

Figure 4


U.S. Population
Need for Morbidity and Well Care
Requirements For Physicians
USFMG
FMG
USMG
Graduate Medical Education
Current Physician Supply
Physician Supply
1990
Desired Balance
1978

based on past training patterns. If patterns change, the Model should be modified accordingly. The GMENAC GME Model significantly advances physician manpower methodologies because it permits estimations to be made for each of the 22 specialties, because branching and switching among specialties is accounted for, and because if a desired distribution of specialist physicians has been determined, the GME Model can be operated in reverse to derive the number of first-year residency positions required to achieve the goal. (See Section VI, C).

c. The Requirements Model is a hybrid between need-based and demand-based methods. This Model takes into account both demand-based data, which reflect current utilization patterns, and need-based figures based on the provision of all services needed by the entire population. The Model then adjusts those figures to the concept, "should in 1990," based on what realistically can be accomplished by that year. The adjustments are made by the Modeling Panel based on recommendations from a Delphi Panel of 6 to 10 experts for each specialty. Although GMENAC has confidence in the Requirements Model, lengthy experience is required to validate the method and judge its utility. (See Section VI, D).

d. By application of these Models, the Panel derived estimates for 1990 physician supply, physician requirements, and the variance between the two, for the aggregate and for each of the 22 specialties. (See Section IV).

e. The Panel made recommendations for full GMENAC consideration on medical school class size and entrance rates of foreign medical graduates. It provided illustrative numbers of filled first-year GME positions required to achieve a better balance between supply and requirements.

4. Strategies

The Technical Panel on Modeling Physician Supply and Requirements was at the center of the GMENAC Process. The Panel analyzed the data input and assumptions in the existing Supply Projection Model in use by the Bureau of Health Manpower and, under contract, developed a separate alternative Model for the GME system to provide a better understanding of the forces determining the supply of and demand for residency training positions. This GME Model was used by the Committee to study and predict changes needed by specialty and by year in the number and mix of training positions in order to meet estimated requirements for the number of practitioners in future years.

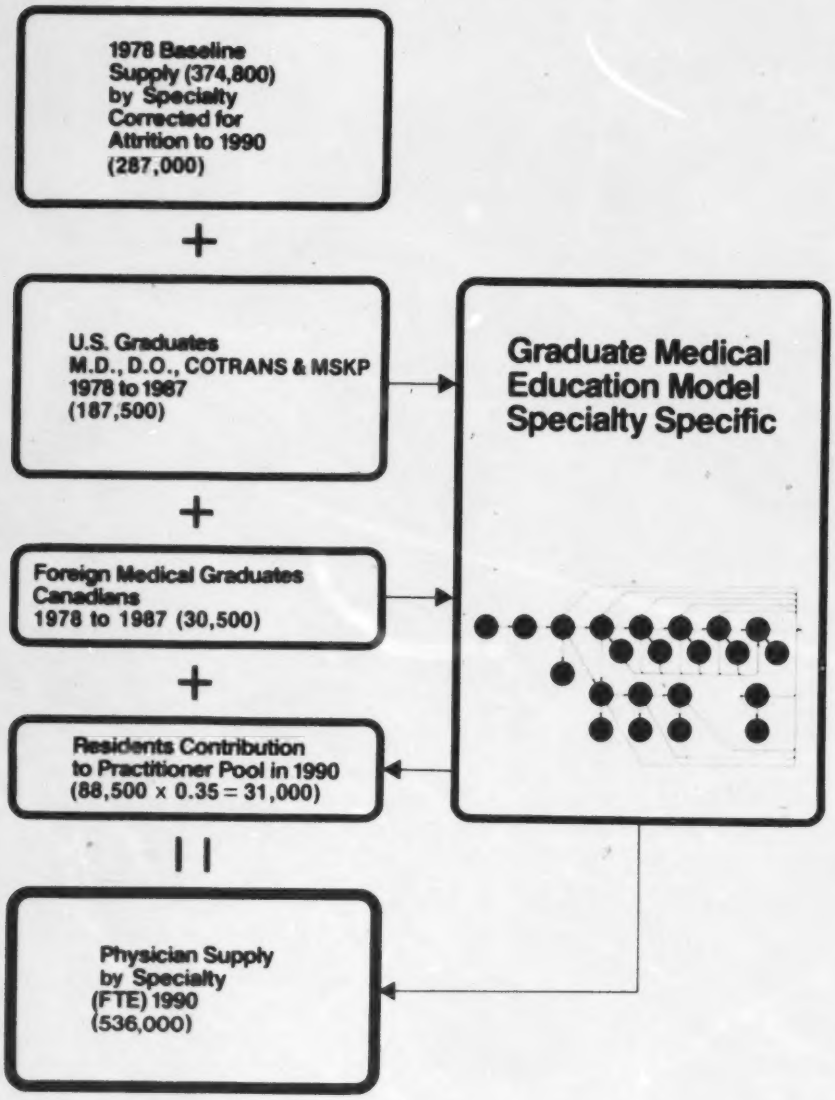
B. Physician Supply Projection Model

1. Introduction

The Physician Supply Projection Model uses simple calculations based on the current number of physicians, attrition of physicians determined by actuarial techniques, and expected additions to the supply based on the number of medical students and residents in training.

Figure 5

GMENAC Supply Projection Model


1978 Baseline Supply (374,800) by Specialty Corrected for Attrition to 1990 (287,000)
+
U.S. Graduates M.D., D.O., COTRANS & MSKP 1978 to 1987 (187,500)
+
Foreign Medical Graduates Canadians 1978 to 1987 (30,500)
+
Residents Contribution to Practitioner Pool in 1990 (88,500 x 0.35 = 31,000)
=
Physician Supply by Specialty (FTE) 1990 (536,000)
Graduate Medical Education Model Specialty Specific

Major problems with the Physician Supply Model are caused by inaccurate physician censuses and by incomplete data on the number of U.S. and alien foreign medical graduates who complete residency training and enter practice.

A third major problem is incomplete information on the specific specialty functions performed by each physician.

Supply data are inadequate for a variety of reasons. Physicians who hold licenses in more than one State are often counted more than once. A registry of the large number of foreign medical graduates in the GME system does not exist. The number of U.S. citizens studying medicine abroad is also unknown. Existing supply methodologies lack acceptable accuracy when estimating individual specialties. A new Supply Projection Model was developed because other models did not determine the number of residency positions needed to achieve a supply objective in a given specialty, a central purpose of GMENAC.

2. Components of the Supply Projection Model

Two tracks in the supply model lead to estimates of future supply. The first is the *Aggregate Supply Track*, which yields aggregate or total number of physicians defined as practitioners or practitioner-equivalents. The second is the *Specialty Supply Track*, which yields an estimation of the future supply in a specialty based on the number of first-year residents entering that specialty and the proportion who ultimately complete training. The more complex second track, the unique component of the supply projection model, provides the same aggregate number but allows estimates in each of the specialties and subspecialties. The two track supply model is illustrated in Figure 5.

3. Aggregate Supply Track

a. Baseline Data

The data sources for current active allopathic and osteopathic physicians are the American Medical Association (AMA) and the American Osteopathic Association (AOA). Each organization periodically surveys physicians in its branch of medicine. Physicians are enumerated on the basis of their primary self-designated specialty, defined as the field in which they spend over 50 percent of their time. Physicians who work less than 20 hours per week are excluded from all active supply figures of the AMA. GMENAC believes these aggregate data from the AMA and similar data from the AOA surveys are sufficiently accurate for its needs. The most recent allopathic and osteopathic baseline data are from 1978 and 1980 respectively. Advantages and limitations of these and other data sources are discussed in the *Interim Report*, 1979.

The major problem about the baseline data relates to the validity of specialty self-designation. Many physicians practice to a variable extent beyond the scope of their primary specialty; for example, thoracic surgeons might perform non-thoracic operations, cardiologists might care for patients with arthritis, general practitioners perform certain surgical procedures. Detailed analyses of specialty self-designation as related to numbers of physicians versus full-time equivalents were conducted. At the national

level, there were no significant differences in the numbers of physicians practicing in each specialty whether counted solely on the basis of primary activity or proportioned on the basis of primary, secondary, and tertiary areas of specialization and practice. At the local level, however, there were major differences in supply counts in some specialties.

b. Attrition Rates

Age, sex, and specialty-specific attrition studies in allopathic medicine were conducted for GMENAC. The study focused on the practice lifespans of thousands of physicians over many years. The attrition rates of women in the future may differ significantly from women in the past in terms of cumulative years of active practice and in what constitutes full-time pursuit of active practice. At present, no specific information is available to base a projected quantitative change in such rates. For women as for minorities, therefore, the attrition rates of the past were used. Once the current base of active practitioners (excluding residents) was reduced for attrition, it was found that approximately 80 percent of the 1978 practicing physicians will be practicing in 1990.

c. New Additions to the Supply: 1978–1990

Between 1978 and 1990, newly trained physicians will be added to the supply from the following sources: U.S. graduates from schools of medicine (M.D.) and schools of osteopathic medicine (D.O.), U.S. citizens who began their medical education abroad but completed it in a U.S. medical school (COTRANS), and foreign medical graduates (FMGs), including U.S. citizens, Canadians and other aliens. It is difficult to estimate the numbers of these additions in the absence of well-defined and executed national policies. Medical school class size continues to rise, new schools develop, the number of U.S. citizens studying abroad, especially in the Caribbean, is increasing, and non-U.S. citizen graduates of foreign medical schools continue to be admitted to the U.S. despite the restrictions of Public Law 94–484.

The GMENAC assumptions on the new additions to supply focus on the following classifications:

1. U.S. medical school graduates: The published 1978–1979 data are the most reliable but can be updated in the model as new figures become available. The first-year enrollment in 1978–1979 was 16,501 students. GMENAC assumes the number will increase at the rate of 2½ percent per year for a total increase of 10 percent between 1978–1979 and 1982–1983. The entering medical school class of 1982–83 will be the last group added to the practitioner pool of 1990. Four years of medical school and three years of residency are average for U.S. graduates.

2. U.S. osteopathic school graduates: The American Osteopathic Association has recently completed its own projection of enrollment increases and development of new schools. The current first year enrollment (1980–81) is 1,478 and is projected to reach 1,868 by 1988–89. More than 80% of osteopathic graduates, complete a one- or two-year internship before entering practice. Students therefore can enter osteopathic school in the 1984–85 academic year, graduate as late as 1988, and still enter the practitioner pool in 1990.

The entering osteopathic class of 1984-85 will be the last group added to the practitioner pool of 1990. AOA has projected a supply of 29,094 osteopathic physicians for 1988-89. The AOA figure includes inactive as well as active physicians, whereas the GMENAC figures are restricted to actively practicing physicians only. The AOA figure is for 1988-89, whereas GMENAC's figures are for 1990. GMENAC assumed that correcting the osteopathic physician supply upward to include one more graduating class, and downward to exclude inactive physicians, would tend to cancel each other. GMENAC accepted the 29,094 figure for 1990 and adjusted this downward by nine percent to 26,470 to exclude residents and interns. (In 1978 residents and interns represented nine percent of active osteopaths. The 1978 practitioner base was 15,096).

3. The Coordinated Transfer Program (COTRANS) and the Medical Sciences Knowledge Profile (MSKP): COTRANS was a program sponsored by the Association of American Medical Colleges for U.S. students who study medicine abroad. From 1970 to 1979 students could take the Part I examination of the National Board of Medical Examiners and distribute the scores to U.S. medical schools to which they were applying for admission with advanced placement. The Medical Sciences Knowledge Profile replaced COTRANS in 1980. The MSKP examination measures knowledge in the sciences basic to medicine and introductory materials in clinical diagnosis. Although U.S. citizens who have not previously attended medical school are eligible for the program, most applicants will be U.S.citizens studying medicine abroad. No more than 300 students per year are expected to be granted advanced placement in U.S. medical schools from this program.

4. Fifth Pathway: The program for U.S. citizens studying in foreign medical schools consists of one year of clinical training sponsored by U.S. medical schools in hospitals in the U.S. To be eligible, a student must complete his undergraduate premedical education in a U.S. college or university and must have completed all of the academic requirements for a degree in the foreign medical school. Each U.S. medical school that participates sets the educational standards that the applicants must meet. A degree is not awarded to the student by the sponsoring U.S. medical school, but students who complete the program successfully are eligible for first-year positions in accredited U.S. residency training programs. Approximately 500 students enter this program yearly.

5. Foreign Medical Graduates (FMGs): In 1979, it is estimated that total FMG entry of all types to the residency pool was 3,100. GMENAC expects this to increase to 4,100 per year by 1983 and to remain stable from 1983 to 1987. A small but unknown number of FMGs may enter practice directly due to the advanced training completed in their countries of origin or earlier training in this country. GMENAC assumes that all will enter formal residency training.

6. Resident contribution to practitioner supply: In estimating physician supply, account must be taken of the contribution of residents to patient care. GMENAC assumes that on the average, each trainee is equivalent to 0.35 FTE practitioner.

7. Practitioner retraining or second careers: The GMENAC Models recognize that physicians in practice may return to GME for additional training. This number is accounted for in the Aggregate Supply Track through attrition and in the Specialty Supply Track by adding residency training positions. The numerical results of the GMENAC Aggregate Supply Projection Model are shown in Table 2, Section III.

4. Specialty Supply Track

a. *Baseline Data*

The Specialty Supply Track of the Supply Projection Model begins with the 1978 AMA and the 1980 AOA base number of actively practicing physicians sorted into each of the 52 allopathic and 21 osteopathic specialties and subspecialties. (See Figure 5.).

b. *Attrition Rates*

Attrition rates are age- and sex-specific, and are applied with rates held constant through 1990.

c. *New Additions to the Supply: 1978-1990*

New additions to the supply between 1978 and 1990 arise from U.S. graduates and FMGs. In the Specialty Supply Track, the allopathic residents are entered into a separate GME Model for each specialty. The ratio between the number who enter and the number who complete differs markedly from one specialty to another. The GME Model accounts for residents who branch into a subspecialty or switch into another discipline. The Model assumes that all allopathic and osteopathic graduates enter GME and that there will be no attrition from the practice of medicine during the GME process. A slight overestimation, therefore, of those completing residency training and entering the work force is inherent. The output from the GME Model distributes physicians among each of the specialties and subspecialties. The GME Model is discussed more fully in the next section.

The osteopathic complement of specialists, in contrast to osteopathic general practitioners, is added to the numbers of allopathic specialists derived from the GME Model. GMENAC has not studied osteopathic medicine to the same extent as allopathic medicine in part because the AOA recently completed its own projection of osteopathic physician supply. GMENAC used the AOA results for its 1990 projection base. The number of specialists in 1990 in osteopathy is difficult to estimate precisely in view of the uncertainty related to the number of residency positions in each specialty in the 1980s. For purposes of this report, the percent specialty distribution of residents reported in 1978 was maintained for the 1990 projection. Owing to the emphasis of osteopathic medical education, 87 percent of the 1990 practitioner supply is expected to be in general practice. The osteopathic general practitioners are listed separately in the GMENAC Tables. Osteopathic specialists, generally small in number, are added to the appropriate allopathic specialists, and entered togther in the GMENAC Tables. (See Table 8).

The Specialty Supply Track and the Aggregate Supply Track produce the same total figure of 535,750 practicing physicians in 1990, when the following formula is used: Begin with the 1978 specialty-specific base for allopathic medicine and the 1980 base in osteopathic medicine, reduce by attrition, increase by new additions to the base in each specialty, and total all specialty results.

Table 8

GMENAC Projection of Osteopathic Physicians, 1990
Exludes Residents and Interns*

Specialty	1990 Projection Number
Anesthesiology	323
Dermatology	54
Internal Medicine	505
Neurology and Psychiatry	158
Nuclear Medicine	107
Obstetrics/Gynecology	170
Ophthalmology and Otorhinolaryngology	221
Pathology	156
Pediatrics	158
Proctology	93
Radiology	544
Rehabilitation Medicine	87
General Surgery	460
Neurological Surgery	15
Orthopedic Surgery	164
Thoracic Surgery	24
Urological Surgery	54
Other Certified Specialties	144
General Practice	23,033
TOTAL	26,470

*Aggregate number derived from the Kellogg Study on Graduate Medical Education, American Osteopathic Association, 1980.

5. Effects of the GMENAC Supply Projection Model

Important ancillary results of the GMENAC supply projection effort advance health manpower planning significantly. Among these accomplishments are: The development of the GME Model; a full-time equivalent study using AMA data tapes; and a heightened interest by the public and private sectors in more refined data collection. The improved cooperation between the public and private sectors in combining their expertise for problem solving is another significant outcome. The methodology is applicable to project physician supply in regions or small areas based on assumptions unique to the locale.

C. The Graduate Medical Education (GME) Model

1. Introduction

The Graduate Medical Education (GME) system is the key to achieving an appropriate balance of physicians in the future. GMENAC has undertaken extensive studies of the GME system and its relationship to current and future physician supply and physician specialty distribution. GMENAC has also examined the manner in which the GME system can be changed to effect a closer balance between physician supply and requirements. The complex GME process is inadequately described by simply listing the numbers of first-year residency positions. In systems analysis terminology,

if the GME process is considered to be a black box, the number of first year residents in each specialty to enter the box is not equal to the number who exit the box in the same specialty.

The pattern of branching and switching or differentation of residents into a variety of specialists is unique for each specialty and subspecialty and relatively stable over time. GMENAC has analyzed the specialty differentiation of nearly 113,000 physicians over the period 1961-1975. These analyses led to the development of a mathematical model, the GMENAC GME Model, which describes the probability of a given cohort of medical school graduates completing residency programs and practicing in a specialty or subspecialty for which data exists.

Assuming that past patterns prevail, the GME Model permits GMENAC to forecast the addition to future physician supply by specialty and subspecialty. The Aggregate Supply Track is useful for estimating total numbers of physicians. But aggregate numbers have limited utility because they do not address the critical issue of the availability of specialty specific services. The Specialty Supply Track and the GME Model, which is central to it, were therefore developed.

2. Data Bases for GME

The major data bases for GME include six sources:

- The annual American Medical Association and Liaison Committee on Graduate Medical Education Directory of Accredited Residencies and the backup raw data files on residents provided to the AMA by program directors
- The Council on Teaching Hospitals of the Association of American Medical Colleges
- The National Resident Matching Program, which publishes results on the number of first year residents who match into each of the specialties
- The American Osteopathic Association Almanac and annual intern and residents contract files
- The Marquis Directory of Medical Specialties, which provides training histories on all physicians who are board certified
- The Educational Commission for Foreign Medical Graduates, which maintains data on FMGs who apply for examination prior to entering training programs in the United States

Each data base was constructed over many years for specific purposes and none was tailored to fit GMENAC's needs. Yet, each is useful to GMENAC if the limitations are taken into account.

Two major problems in the data base occur because of inconsistencies in classification. One major problem is the change in nomenclature for the first postgraduate year. Formerly called internship, it is presently referred to as residency in many specialties. A second problem is the difficulty in differentiating between the latter years of formal residency training and fellowship training. Fellowship training is specialty or subspecialty training after completion of residency.

Minor problems occur because data are not available. No data on the number of residency positions offered and filled for intermediate years of graduate medical education in each specialty are available. Some specialty programs designate their entry year as first year residency while other programs in the same specialty designate their entry year as the second postgraduate year. Dislocations occurring in residency training due to the Vietnam conflict are unrecorded.

Given these and other limitations, GMENAC has found the data, when combined from multiple sources and multiple years, amendable to valid statistical manipulations for the purpose of designing a flow model to predict the future output from GME training programs on a specialty and subspecialty specific basis.

3. The History of the Development of the GME Model

In 1976 the Division of Medicine of the Bureau of Health Manpower began to design studies to improve upon existing physician supply projection models by disaggregating physicians into discrete specialties and subspecialties. The only base for determining the specialty of physicians is the self-declared method used by the AMA. In this method, a physician declared him- or herself to be practicing in a given specialty if the majority of his or her practice involved that specialty. In another variant of this method, the physician reported the proportion of his or her time spent practicing in one or more specialties and the results were aggregated for all physicians to produce full-time equivalents for each specialty. When these two methods of reporting were compared at the national level, the estimates of physician specialty distribution were found to be equivalent. Consequently, estimates derived from the method involving majority of time spent can be used.

Models existing in 1976 to project specialty-specific physician supply either combined broad categories of physician specialists, such as surgical specialists and medical specialists, or primary and non-primary care specialists. The models assumed that recent entry data to GME or board certification rates would hold constant into the future. Little empirical evidence was available upon which to base specialty-specific projections.

In May, 1979, a national conference was held on manpower modeling in conjunction with the Health Application Section, Operation Research Society of America. Contracts were let to three consultant groups to develop a specialty-specific Supply Projection Model with a GME component. The work was completed in April, 1980. The American Medical Association completely restructured two of its largest physician data bases for this purpose.

4. The GME Model

The GME Model is based on the career records of 190,000 allopathic physicians maintained by the American Medical Association, of which 112,610 contained interpretable GME data. These records covered physicians who graduated from medical school between 1961 and 1975. These data were augmented by selected subsamples from the Marquis Who's Who *Directory of Medical Specialists,* which also contains the names and educational histories of approximately 190,000 active physicians certified by the specialty boards prior to June, 1977.

These GME histories were analyzed for each cohort of medical school graduates in order to show the proportion who entered each specialty or subspecialty in the first postgraduate year. The histories were also analyzed for the frequency with which each cohort entered a next year of training in that field or another or entered practice. A simple sample for the year 1961 graduating cohort shows that the proportion moving through successive years of training and into general surgery (GS) practice were as follows:

MS -.99-> INT -.83-> GS1 -.58-> GS2 -.78-> GS3 -.89-> GS4 -.53-> PRACTICE AS GS = 17%

MS = Medical School
INT = Internship
GS = General Surgery Resident Year

The GME process is complex because physicians can follow multiple routes to the same specialty of practice. For every 100 medical school graduates in 1961, 17 were in practice as general surgeons by 1975 going directly through an internship and general surgery resident training program. But other physicians in 1975 were practicing general surgery after having traversed other GME paths. Figure 6 shows some of the GME routes to practice in orthopedic surgery. The node labeled ORS3 in Figure 6 shows that 74 percent of the residents in the third year of an orthopedic surgery residency go on to a fourth year in orthopedic surgery while 24 percent go into orthopedic surgery practice. One percent go from the third year of an orthopedic surgery residency into a completely different or other specialty (OS) while another one percent go back to a first year general surgery residency (GS1).

The GME Model represents a mathematical averaging of all the routes to practice in each specialty as traversed by all medical school graduates between 1961 and 1975. The model uses what are called transition frequencies from one year of training to the next in the same or a different specialty according to postgraduate year. These transition frequencies have been shown to have what is known as Markovian properties, that is, they do not depend on prior training experiences. Empirical data have shown that regardless of the routes residents follow to their fourth postgraduate year in orthopedic surgery they will all have the same probability of going either into practice, into a fifth year of orthopedic surgery, or into a different specialty.

The second important fact in the analysis of the 1961–1975 data is called stationarity. Except for the period of the Vietnam conflict, the transition frequencies from one specialty to another or from one year of training in a specialty to the next in that specialty is nearly constant from one graduating cohort to the next.

The Committee recognizes that because of some definitional problems, as in the preventive medicine subspecialties, and because of more recent changes in some specialties, such as family practice, the GME Model represents only a first iteration and must be exercised and modified as new data become available. The Committee believes that the GME Model when coupled to the Supply Projection Model produces useful projections of the future specialty distribution of physicians. GMENAC is also reasonably confident that meaningful comparisons can be made with future requirements projections and that imbalances between supply and requirements can be identified.

5. Use of the GME Model in Equilibrating 1990 Supply and Requirements

GMENAC's modeling work in both supply and requirements projections leads to the following simple arithmetic end point:

> (1990 physician supply in specialty "x") — (1990 physician requirements in specialty "x") = (1990 balance (0), surplus (+) or deficit (—) of physicians in specialty "x")

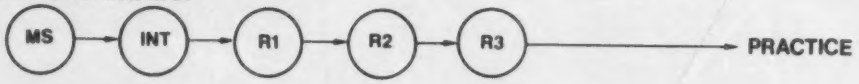
If specialty "x" is estimated to be in balance in 1990, GMENAC would suggest that the residency training programs in that specialty produce resident graduates in the numbers assumed by the GME Model based on the residency training numbers in that specialty and on immigration rates of FMGs into that specialty.

The GME and the Supply Projection Models have been operated in reverse from 1990 to 1978 in order to determine the changes needed in residency training outputs and immigration rates, year by year, to reduce a surplus or deficit in a specialty. In some specialties, minor adjustments in residency training capacity and production rates over the next decade will lead to a near balance between supply and requirements. In other specialties, major problems, some insurmountable, arise in searching for a formula that will bring supply into balance with requirements by 1990. For example, in specialties heavily dependent on FMGs in the past, such as psychiatry and physical medicine and rehabilitation, complex changes in both immigration policies for FMGs and career selections by USMGs will be needed if the deficit is to be corrected. Neither solution seems achievable by 1990. In some specialties, such as general surgery and cardiology, a balance between supply and requirements in 1990 would not be achieved even if all production of these specialists is stopped for several years. Complete cessation of training in a specialty would not only be severely disruptive to training and destructive to the specialty, but might lead to severe shortages in the 1990s because of accelerated attrition rates in the 1990s due to the age distribution of these specialists. Therefore, in simultaneously attempting to achieve a balance in each specialty and a balance in the aggregate supply and requirements, the only apparent solution from a purely mathematical perspective would be to close several

Figure 6

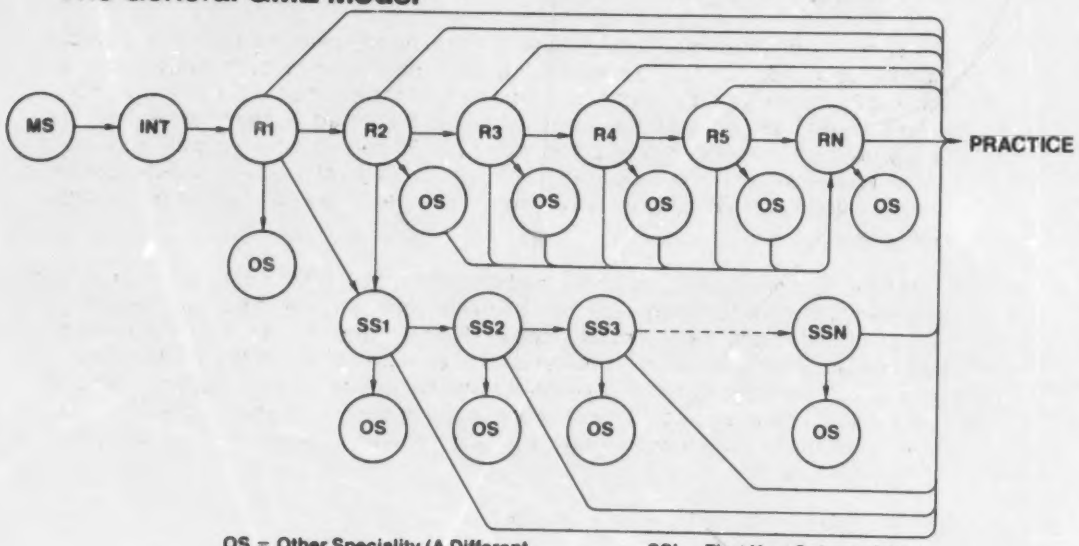
Graduate Medical Education Model

A Simplified Flow Model



Each step represents one year
MS = Medical School
INT = Internship
RI = First Year of Residency, Etc.

The General GME Model

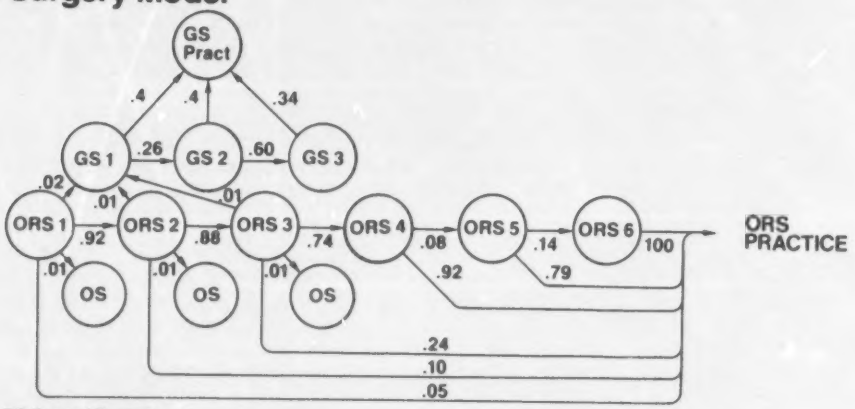


OS = Other Speciality (A Different Residency Program or Practice in Another Specialty)

SSI = First Year Subspecialty Residency, etc. ETC.

Time From One Point to the Next Connected Point is One YEAR

Orthopedic Surgery Model



GS-General Surgery
ORS-Orthopedic Surgery

Jacoby, I. Graduate Medical Education: Its Impact on Specialty Distribution, *JAMA* 245:1046-1051, Mar 13, 1981

U.S. medical schools and expand immigration of FMGs from certain third world countries. While obviously an irresponsible and frivolous option, it is cited to illustrate the magnitude of the problem in some specialties in 1990. GMENAC has recommended that no specialty should be expected to increase or decrease the number of entrants into its residency programs by more than 20 percent by 1986.

The specialty distribution of osteopathic physicians has been handled in a separate module, as an addition to the allopathic module. In 1990, osteopathic physicians are expected to make up 5 percent of the total supply of physicians, but 87 percent of them will be in general practice. However, within the broad category of general and family practice, they will make up approximately 28 percent of the supply. In view of the emphasis within the osteopathic profession on general practice, GMENAC eliminated modeling the GME training system in the other 15 board certified osteopathic specialties.

GMENAC recognizes the limitations of the GME Model and the data bases on which it operates, but it also recognizes that the design of the model is sound. The utility and quality of results can be much improved in the future as new data are developed, and new assumptions based on better empirical information are formulated. The GME Model for most specialties yields results that are dependable for predicting the direction and general magnitude of changes needed for each year in the GME system in order to achieve or maintain future physician supply in balance with future physician requirements.

D. Physician Requirements Model

1. Background

The GMENAC *Interim Report*, 1979 presented a discussion of various methods for estimating the numbers of physicians needed in future years. (See Chapter VI). Strengths and weaknessess of the two most relevant methods, a need-based model and a demand-based model, were discussed. The rationale for GMENAC's adoption of an adjusted need-based approach was explained and the Physician Requirements Model was discussed in detail. The Report described the early application of the Model to obstetrics/gynecology. (See Chapter VII). Application of the model to 31 specialties and subspecialties has been accomplished. Requirements estimates for six other specialties have not been completed.

2. The Generic Model

The Model has been discussed with major organizations such as the Kellogg Foundation Task Forces on Graduate Medical Education, Graduate Osteopathic Education and Graduate Dental Education, the Macy Foundation Study on Graduate Medical Education, the Council of Medical Specialty Societies, the Coordinating Council on Medical Education, the Liaison Committee on Graduate Medical Education, and numerous individual specialty and subspecialty organizations. It has also been discussed on several occasions with staff within the Department of Health and Human Services, the Department of Defense, the Veterans Administration, the Office of Technology Assessment, the General Accounting Office, and the Institute of Medicine.

The conceptual framework of the Requirements Model is illustrated in Figure 7. For each of the 31 specialties and subspecialties to which the model was applied, the GMENAC staff assembled all available data on:

- The practice content of physicians within each specialty and subspecialty.
- The trend data on the incidence and prevalence rates of diseases treated by each specialty and subspecialty.
- The estimates from various surveys on the amounts of ambulatory care or surgical care required to care for each disease or condition.
- The recommendations from various experts on the levels of preventive and well person care that should be consumed by various age groups of the population.
- The estimates of productivity of physicians in each specialty and subspecialty, such as the number of ambulatory care visits and the deliveries or operations performed per year for the average practitioner in each specialty.
- The roles of nonphysician providers, both in terms of substitutability and complementarity for physicians in each specialty and subspecialty.
- The various estimates of requirements for physicians in each specialty and subspecialty for teaching, research, administration, or other functions apart from direct patient care.

A Delphi Panel of Experts was constituted for each specialty and subspecialty. Over a thousand nominees were submitted by the major specialty organizations and GMENAC members. Ultimately, approximately 180 physician consultants and 30 nonphysician health care providers were used in the various medical and surgical specialties. Most Expert Panels were comprised of three to five members of the specialty being studied, one or two physicians from the primary care specialties, one or two nonphysician providers, and one to three physicians from complementary or overlapping specialties. In the makeup of each panel, there was an attempt to include females, minorities, academicians, and private practitioners, urban and rural representatives, and members from the four geographic areas of the country. In the pediatric subspecialties, only a single expert from each subspecialty who worked with members of the General Pediatrics Expert Panel was consulted. For each internal medicine subspecialty, three experts who also met with the Adult Medical Care Expert Panel were utilized.

Once the Expert Panels were selected by GMENAC, they were convened by a GMENAC member and presented with the background data and workbooks prepared by staff. Most panels met two or three times for two days each time. The Preventive Medicine Panel met only once for two days and the Adult Medical Care Panel met six times for two days each. Some panelists also consulted extensively among themselves and with staff by telephone, and others performed a great deal of work at home.

The decision-making process for each panel generally followed a modified Delphi process. Final results of the work of each panel were compiled from secret ballots, using median values as the final recommendation from each Panel. However, extensive discussion among panel members, the GMENAC convener, and the staff, preceded the final ballots.

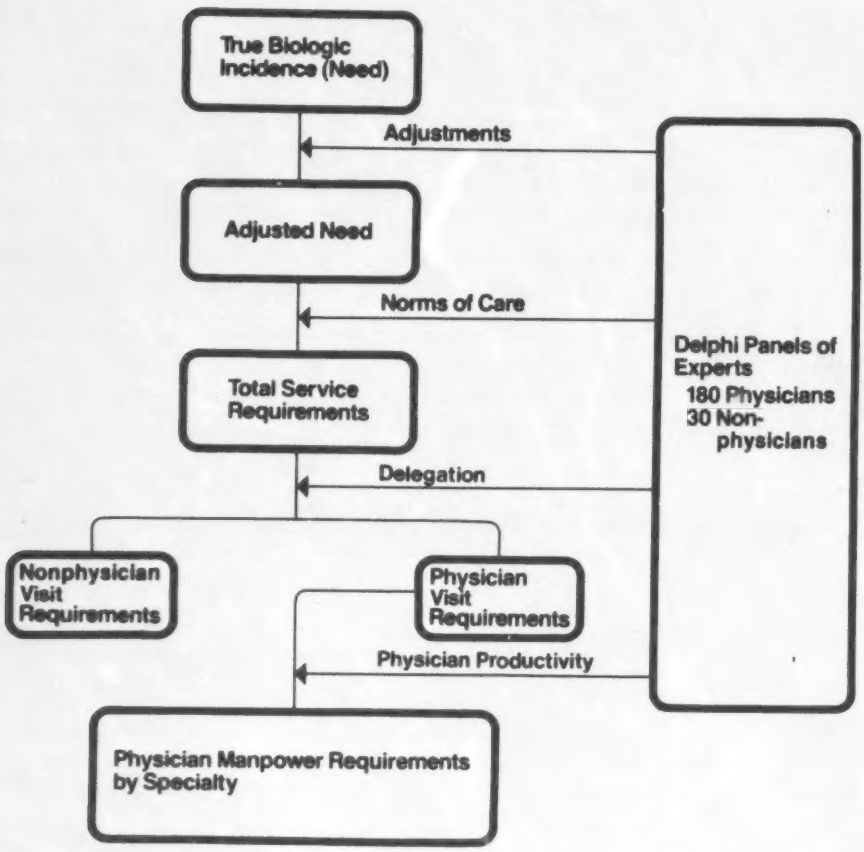
The workbooks for each Panel that used the generic Model were organized similarly and every Panel received the same instructions and was instructed to use the same definitions. The same baseline or reference data were presented to each Panel for those diseases or conditions which were common to the practice of two or more specialties. Many problems arose with the concept of "adjusted need." Instructions were given to each Panel to conduct their deliberations within the context of what should occur in 1990, rather than what will or might or could occur in 1990, under various conditions. The intended instruction was that each Panel consider what should occur in 1990 in terms of realistic expectations of patient and provider behavior without regard to economic barriers to care. The Panels were instructed to consider the likely impact of foreseeable changes in technology, and improvements in patient motivation and compliance as the population becomes better educated. The Panels were instructed to factor into their judgments constraints of geography and population distribution.

In all estimates, the panelists were urged to look beyond their own practices and to conceptualize what the average for all practitioners in that specialty nationwide should be in 1990. Panelists were directed to avoid overweighting the extreme values. Starting with the reference data contained in the workbook and its concept of true need, each Panel developed its median estimate for each parameter of the generic Model shown in Figure 7. The first decision was to review the accuracy and relevancy of data on the incidence and prevalence of those diseases that make up the bulk of the physicians' practices in that specialty. The result of that process was the total number of cases or people who need care from that specialty for each disease condition, operation, and type of well person or preventive care that should fall under its purview in 1990.

The Panel next developed norms of care for each disease condition, operation, or preventive service, based on current data and its concept of what should constitute desirable rather than utopian or optimum medical care. The Model multiplies the number of expected incident or prevalent cases of each disease or condition in 1990 times the norms of care. The individual products, when summed, yield total service requirements for that specialty for the total 1990 population. At this point in the Model, the specialty is defined as the physician together with aides and nonphysician providers who work in the office or directly under the physician's supervision.

Figure 7

Physician Requirements Model



The panelists next considered the issues related to roles and uses of nonphysician providers in each specialty. The National Center for Health Services Research produced and shared with the Panels extensive reviews on the utilization of various physician providers in each specialty. The Panels considered only those tasks or functions carried out by nonphysician providers which have been traditionally provided by physicians. Excluded were purely nursing, secretarial, social service, audiological, and other tasks usually not performed by the physician.

The Panels were concerned both with task delegation by physicians and substitutability for physicians, but each is treated differently in the Model. Under the norms of care for conditions treated in the ambulatory sector, the units of measurement are generally office visits per year or per episode. The Panels estimated the percent of total office visits for each condition that should be handled by or delegated to nonphysician providers. This percentage represents substitution of nonphysicians for physicians for a portion of the total number of office visits required for each condition and decreases the requirements for physicians in the Model. The nonphysician providers remain under the formal supervision of physicians under these circumstances. This process is called visit delegation. When nonphysician providers perform isolated tasks during a patient's visit with a physician, the visit is ascribed to the physician for manpower calculations, but the productivity of the physicians is increased. This process is called task delegation.

The total services required from physicians' offices in Figure 7 are reduced by the percent of office visits that should be handled by nonphysician providers. The definition of "should" in this case means that the care to be provided in each delegated office visit does not require the unique training and skills of a physician. For example, if on the average, the Panel estimates that two office visits to a generalist are needed for the management of each person with strep throat, but only the initial evaluation and treatment protocol requires the skills of a physician, the Panel might recommend that the follow-up visit, which is half of the total requirement, be delegated to the nonphysician provider.

The Expert Panel next focused on the factors that affect or are likely to affect physician productivity now and in 1990. Productivity is expressed as the number of office visits per year, the number of deliveries or operations per year, or other measurable outputs that the average physician in that specialty should be able to manage. Included in estimates of productivity are expected changes in the number of hours worked per week and the number of weeks worked per year. Productivity enhancement is considered in the perspective of possible expanded use of nonphysicians, while diminished productivity may result if delegation of the routine cases results in the physician having a greater proportion of difficult, time-consuming patient encounters.

After nonphysician delegation is subtracted, the Models divide the total physician requirements in each specialty by the expected average productivity of a typical physician in that specialty in 1990. The quotient is the number of full-time equivalent (FTE) physicians required in each specialty for patient care activities. In the next step, the Expert Panel estimates the percent of effort in its specialty that should be devoted to teaching, research, and administration in 1990. This is added to the FTE physicians required for patient care.

Where relevant, similar calculations for both office and hospital components of practice are carried out, based on the work of the Delphi Expert Panels. The final results include all aspects of practice and represent the total number of physicians in each specialty or subspecialty required in 1990 to deliver good medical care, including preventive and administrative services, to all persons who need care. The results assume no economic constraints or barriers to care.

3. Requirements in Six Specialties Which Were Not Modeled

The generic Model was applied to 31 specialties and subspecialties, leaving six major specialties unmodeled or only partially evaluated. Early in 1980, GMENAC realized that it would not be able to conduct complete studies of physical medicine and rehabilitation, pathology, radiology, nuclear medicine, anesthesiology and neurology. In 1978, these specialties together accounted for 49,000 physicians or nearly 14 percent of the total. While GMENAC intended to include these specialties in its modeling work, the Committee's resources were consumed in modeling the 10 internal medicine and six pediatric subspecialties, which were essential to the estimation of requirements for the general fields of pediatrics and internal medicine. Requirements in these specialties for 1990 significantly affect the aggregate number of physicians needed. Some of these specialties appear to face severe disparities between future supply and requirements.

The GMENAC approach to physical medicine and rehabilitation, pathology, radiology, nuclear medicine, anesthesiology and neurology consisted of the following:

- A comprehensive literature review was conducted by the Battelle Human Affairs Research Centers in Seattle, (the contractor that had previously assisted GMENAC in modeling the eight surgical specialties). Battelle analyzed all studies on physician requirements in these specialties and applied the methodologies of the original studies to 1990, using the same parameters as were used in the initial study to estimate requirements. In this effort, Battelle consulted the major organizations in each field for their assessments of the adequacy of the studies in the literature and to be certain that none had been missed. Battelle submitted its results to GMENAC, in *A Survey of Physician Requirements in Six Specialties.*

- The GMENAC Technical Panel on Modeling Physician Supply and Requirements reviewed the Battelle Report and consulted with knowledgeable individuals in each specialty. The Panel also examined current data on residency training capacity, including the number of positions offered and filled and the characteristics of the training programs such as the percent of the residents who were foreign medical graduates, and trends and potential substitutability and complementarity of nonphysicians. The Modeling Panel then developed its recommended range of requirements for 1990 based on this information.

- The full GMENAC Committee in Plenary session in July, 1980, considered the recommendations of the Modeling Panel. Representatives from the major organizations in each of these specialties were invited to critique the Battelle and Modeling Panel findings and to present their own estimates of physician requirements for 1990 in their specialties. After hearing the various viewpoints, each GMENAC member completed a ballot. The final requirements estimates in each of these six specialties represent the consensus of a majority of the GMENAC members. It should be

emphasized that these requirements estimates should be considered tentative because of the haste with which they were produced. Appropriate studies should be carried out to establish their validity.

GMENAC has developed a requirements projection for the three preventive medicine subspecialties of occupational medicine, aerospace medicine and a combination of general preventive medicine and public health. However, due to the extreme paucity of data and late start in modeling this specialty, the results represent only a rough approximation of physician requirements. High priority ought to be given by the Department of Health and Human Services and the profession to the development of a comprehensive model for preventive medicine, and an adequate data base on which to make projections.

4. From the Generic Model to GMENAC's Final Requirements Recommendations

The results from each Delphi Panel of Experts together with their assumptions and caveats represent the first of three levels of analysis of physician requirements by GMENAC. The second level of analysis is carried out by the GMENAC Technical Panel on Modeling Physician Supply and Requirements, while the third level or final analysis and recommendations are developed by the GMENAC Committee in plenary session, with testimony from the public and from professional organizations and individuals concerned with each specialty.

The second level of analysis of physician requirements brings the adjusted-need figures from the Expert Panels into conformity with reality and achievability as perceived by the Modeling Panel. The explicit purposes of the second level of analysis by the Technical Panel on Modeling are threefold:

- To eliminate the overlap that inevitably occurs when two or more specialties or subspecialties deal with the same disease or condition—e.g. herniated intervertebral discs by both neurosurgery and orthopedics, or treatment of acute myocardial infarction by internists, general and family practitioners, and cardiologists. The Model requires that decisions be made on appropriate portions of the total requirement for each involved specialty. Of course, some duplication of care for specific conditions is needed, e.g. when combined therapies are prescribed or both surgical and medical care are required for a disease such as ulcerative colitis or coronary artery disease.

- To superimpose on the deliberations of the Delphi Expert Panels consideration of some economic, social, and behavioral constraints that will affect the overall attainment of the level of services required using the adjusted need approach.

- To consider all the physician supply sources available to meet the total physician requirements in each specialty. The Modeling Panel has examined the previous career choices of U.S. and foreign medical graduates, the capacity of the allopathic and osteopathic schools to produce graduates with specialty-specific predilections, and the capacities of the various specialty and subspecialty training programs to produce the numbers of specialists needed to meet the 1990 requirements as recommended by the Expert Panels in each discipline. Representatives of each Expert Panel were invited to explain their recommendations. Various national organizations

also provided testimony. Information from the Technical Panels on Financing, Educational Environment, Geographic Distribution, and Nonphysician Providers was incorporated into the Modeling Panel's deliberations.

The final recommendations on requirements from the Modeling Panel represent, therefore, a synthesis of all the data it has received from each of the specialty and subspecialty Expert Panels and from the other Technical Panels of GMENAC. It considered the physician manpower requirements developed by all the Expert Panels in view of the constraints of reality on the achievement of those levels of manpower. Its recommendations on requirements, therefore, represent a middle position between what is truly needed and what is reasonably achievable by 1990. While GMENAC has based its modeling work on a 1990 target, in some specialties the attainment of the 1990 goal may not be achievable and the Modeling Panel's recommended 1990 requirements may be at variance with the results of the Expert Panels.

The third and final level of analysis of physician requirements in each specialty and subspecialty involves a public hearing wherein the recommendations and rationale that surfaced from the first two levels of analysis are critiqued by interested parties. Thereafter, the GMENAC members vote in secret ballot on recommendations from the Modeling Panels. They may accept the recommendations from that Panel or develop another estimate of physician requirements in each specialty based on all they have heard. The final recommendations from the Committee are derived from a majority vote. Volume VII of this GMENAC Report contains in the Appendix the opinions of some GMENAC members who took exception to the recommendations developed by the majority of members.

A. Introduction to the Technical Panels

The sources of the health manpower problems, the actual problems, and the potential solutions for them were circumscribed into areas of exploration which formed the basis for four Technical Panels. A fifth Technical Panel on Modeling Physician Supply and Requirements is discussed in the preceding section. The organizational scheme for these Technical Panels attempted both to isolate the forces for change in these categories and to capture the interrelatedness of four determinants of health manpower problems: nonphysician providers, geographic distribution, educational environment, and financing.

Nonphysician health care providers often render substantial services traditionally provided by physicians. Therefore, increasing the supply of nonphysicians, as has occurred over the past 15 years, could lessen the requirements for physicians. The purpose of the Nonphysician Provider Panel was to estimate the role of nonphysician providers in the delivery of health care services and to study the implications of the existence of such providers on the needs for certain categories of physician specialty manpower.

Geographic considerations influence manpower planning in several different ways. An uneven dispersion of physicians could create a surplus of physicians in one location and a shortage in another. Corrective action often attempts to increase the number of physicians in the shortage location by increasing the overall supply rather than by a process of redistribution. It is likely that this inefficient manpower deployment has yielded a 110 percent capacity when 100 percent would have been sufficient with more appropriate location considerations. Significant also is the fact that the rates at which medical services are utilized varies among different geographic areas. These and other inquiries established the purpose of the Technical Panel on Geographic Distribution.

The Technical Panel on Educational Environment examined key factors in the education spectrum that influence geographic and specialty choice. The panelists' deliberations encompassed a variety of topics ranging from premedical education to post-residency experiences, from personal factors influencing career choice to the stimulation by external factors from both within and without the medical school and teaching hospital.

Financing of graduate medical education and payment of physician fees are largely through third party payors and a large fraction is through governmental sources. This system, with its requirement for public accountability, has brought significant regulation to the financing of medical training and practice. The influence of these regulations on specialty and on geographic choice was thought to be a significant factor contributing to the maldistribution. The purpose of the Finance Panel was to examine the general impact of different means of financing medical education, housestaff training, the delivery of services, and the impact of each upon distribution by specialty and geography.

These four separate but interrelated areas of exploration by the Technical Panels comprised the intellectual center of the GMENAC process. The separate contribu-

tions are discussed in each Panel summary. The interrelation of these types of exploration is easily illustrated. For example, recommended changes in the supply of nonphysician health providers would not only modify the requirements for physicians but also require changes in the educational institution to accustom new physicians to working in alliance with these health workers. Such a recommendation might require financial adjustments in allocation of training funds, reimbursement for nonphysician services, and licensing changes, and would modify the geographic distribution of available health services as well. Another example shows that financial modifications in the reimbursement system to provide incentives to favor ambulatory practice in medically underserved locations would not only influence the geographic availability of services but would also likely lead to changes in the teaching institutions such as the development of ambulatory teaching units in inner city and rural regions and general curricular revision.

The composition of the Panels acknowledged the interrelationship of these four areas. Each Panel was composed of three to nine GMENAC members, one of whom served as the Convener. The Panels were also served by one or more staff members from the Office of Graduate Medical Education. Most Panel members served on more than one Technical Panel and the Conveners comprised the Plans and Methods Group. The staff frequently interacted over issues that transcended the boundaries of Panel assignments.

The process of the panelists began with a charge from the GMENAC Committee and concluded with recommendations to that same Committee. Although the approaches varied, the strategy common to the four Technical Panels can be summarized in the following phases: (1) the examination of the charge, (2) a review of the literature, (3) the analysis of the data bearing on the topics, (4) the identification and understanding of the problems within the area that were related to the broader charge of GMENAC, and (5) the formulation of recommendations. In the fourth phase, consultant advice was frequently sought and throughout all phases there was an interaction among all members. The fifth Panel on Modeling patterned its workplan in a different manner because of the different nature of its undertaking.

Complete reports of the Technical Panels are published in Volumes II-VI of the *GMENAC Report*. Summaries of each of the four panels are organized in this section according to the following topics:

1. Members
2. Charge
3. Accomplishments
4. Strategies
   a. General Approaches
   b. Review of Literature
   c. Conceptual and Methodological Framework
   d. Philosophy
5. Findings

B. Technical Panel on Nonphysician Health Care Providers

1. Members

During the duration of GMENAC, some members of the Panel on Nonphysician Health Care Providers (NPHCPs) were replaced with new appointees. The Convener of the Panel for its entirety was an internist, the chief operating officer of a system of hospitals with a large teaching component. At the time the final report was written, other members of the Panel included two registered nurses, one an associate director of health services for nursing and clinic operations of a large urban community health center and an assistant professor of nursing at a baccalaureate nursing program. The other nurse is a national representative of the Federation of Nurses and Health Professionals, A.F.T./A.F.L.-C.I.O. Other members included a psychiatrist, an ophthalmologist, an osteopathic pediatrician, and an officer of the U.S. Naval Health Science Educational and Training Command.

Three Panel members were also members of the Technical Panel on Finance. Important consultant information was provided by the Kaiser Foundation Research Group, which provided analysis of the utilization, acceptance, and cost effectiveness of nonphysician health care providers in the Kaiser system.

2. Charge

The initial charge to the Panel was to identify types of nonphysician health care providers who might have an impact on physician specialty requirements in 1990 and to locate data on their roles and on their current and future numbers. The definition of nonphysician health care providers includes the nonphysicians who supply services traditionally provided by physicians with the main emphasis on nurse practitioners, physician assistants, and nurse-midwives. These three groups of nonphysicians directly affect manpower requirements in adult medical care, in child care, and in obstetrics/gynecology. Other nonphysician health care providers, including optometrists, podiatrists, psychiatric social workers, and psychologists, have a direct effect on the manpower requirements in their respective specialties, but full assessment of their services was not undertaken.

The Panel's charge also included an examination of the geographic dispersion of nonphysician health care providers and their role in providing services in medically underserved areas. The study of financial considerations such as support for training programs, reimbursements for services, and cost effectiveness was also requested. The Panel was asked to examine the education and training of each category of nonphysician health care provider, that is, the training programs, the curriculum, and the entrance rate to practice of their graduates and to project the manpower supply in each category of nonphysician health care provider for 1990.

A later expanded charge to the Panel included an assessment of the feasibility of attaining levels of delegability to nonphysician providers as recommended by Delphi Panels and the Technical Panel on Modeling. A projected physician surplus in 1990 extended the charge to include the examination of the proposition: Given adequate physician supply, identify other reasons for supporting the training of nonphysician providers.

3. Accomplishments

The NPHCP Panel contributed to the present state of knowledge about nonphysician providers of health care and to projections and recommendations for the future. The major accomplishments of this Panel advanced the understanding of nonphysician providers and projected supply and feasible rates of delegation for 1990. The Panel also contributed significantly to the GMENAC Committee's appreciation and justification of the reasons and desirability for nonphysician providers in spite of a projected oversupply of physicians.

a. The Panel extensively reviewed the literature and composed briefing papers that discussed the involvement of nonphysician providers in 13 different medical and surgical specialties. The Panel also wrote four staff papers that form part of the GMENAC library.

b. The Panel reviewed and analyzed the available reports on the functions, acceptance levels, and cost-effectiveness of nurse practitioners, physician assistants, and nurse-midwives.

c. The Panel provided data on the current supply and the projected supply in 1990 of several specialties of nonphysician health care providers.

d. The Panel assessed the feasibility of the rates of delegation to nonphysician providers suggested by the Modeling Panel for adult, child, and obstetrical/gynecological care.

e. The Panel provided a forum for consideration of the reciprocal requirements of physicians and nonphysician health care providers, especially germane in situations of physician surplus.

f. The Panel formulated 24 recommendations which gained the approval of the full GMENAC Committee.

4. Strategies

a. General Approach

Early deliberations with consultants and other experts helped the Panel illuminate its charge by focusing on six critical concepts: (1) the definition of nonphysician health care provider, (2) the identification of relevant nonphysician provider types (3) the dependent versus independent nonphysician providers, (4) the relationship of the nonphysician to the physician, (5) the complementary versus substitutive functions, and (6) the actual versus potential delegation. An extensive review of the literature was supplemented with staff papers, which describe the present status and functions of a variety of nonphysician providers and briefing papers, which examined the role of nonphysician providers in 13 different medical and surgical specialties.

The Panel critically evaluated the feasibility and desirability of the delegation levels proposed for adult medical, child, and obstetrical/gynecological care. In many cases, the Panel found the proposed levels unattainable and offered alternatives.

b. Review of Literature

An extensive literature review describes the existing status and functions of nonphysician providers. Most of the literature review is organized and summarized in the 1979 *Interim Report.* Two kinds and sources of information on nonphysician providers in the primary care specialties appear important. The first consists of major studies of the training, deployment, and productivity of these providers, and the second consists of major syntheses studies of nonphysician providers.

The staff provided working papers which were concise analyses of the literature in four separate areas. The first of these papers, *Content of Care,* focuses on services provided by physicians. The second paper, *Delegability,* focuses on the roles of nurse practitioners and physician assistants providing services traditionally provided by physicians. The third paper, *Consumer Views of the Impact of Nurse-Midwives,* explores the attitudes of consumers and consumer organizations toward nurse-midwives. The fourth, *Nonphysician Health Care Providers,* reviews the constraints affecting the use of nonphysician providers and examines the rates of delegation currently taking place in general and family practice, pediatrics, internal medicine, and obstetrics/gynecology. Three other papers on desirability and feasibility of the proposed delegation levels in obstetrics/gynecology, in adult medical care, and in child medical care were also produced. (See Nonphysician Papers, Office of Graduate Medical Education).

c. Conceptual and Methodological Framework

The conceptual framework adopted by this Panel was an outgrowth of the analyses of six critical topic areas: definition, complementary versus substitutive functions, visit versus task delegation, accountability, legal and regulatory concerns, and performance evaluations. Because the Panel concentrated on nonphysician providers in obstetrics/gynecology and in the primary care fields of internal medicine, pediatrics, and family practice, it focused primarily on nurse practitioners, physician assistants, and nurse midwives. Other nonphysician health care providers were not studied in great detail.

Complementary versus substitutive functions was a further critical focus in the conceptual framework of the NPHCP Panel. Complementary services are support services, which do not affect the requirements for physicians. Substitutive functions, as the name indicates, are those ordinarily provided by physicians, but in this case are provided by nonphysician health care providers who substitute for physicians and thus lessen the requirement for physicians. The Panel focused on substitutive functions and did not examine the full range of nonphysician activities.

Another major component in the conceptual framework of this Panel related to the difference between task delegation and visit delegation and between complementary versus substitutive functions. With task delegations to a nonphysician provider, the physician retains position as the principal care giver with a nonphysician performing some of the tasks within that office visit which might be complementary, substitutive, or both.

Task delegation was of minor concern to GMENAC and was accounted for in those practices where it is used to increase the productivity of the physicians to reflect this. Visit delegation, where the nonphysician provider serves as the principal provider, was an essential quantitative feature of the GMENAC modeling methodology. The work of the Modeling Panel in this regard was closely monitored by the Nonphysician Panel.

In any discussion about task versus visit delegation, it must be realized that there is a discrepancy between what nonphysician providers actually do and what theoretically they might do based on their training and skills. Constraints limit their utilization in many sites. In order to predict the extent of their utilization in the future, it is necessary to have some idea of what the maximum level of delegation or substitution might be. The Panel's task was to determine what a desirable level of delegation/substitution might be and how to achieve it.

The conceptual framework of the Panel also included the factor of nonphysician to physician accountability. Nurse practitioners and physician assistants, when they are performing tasks traditionally provided by the physician, are accountable to the physician. Although physician assistants practice only as dependent providers, the nursing profession has many independent spheres of practice.

Currently, some nurses are engaged in independent practice providing such nursing services as teaching and counseling, home nursing, injection of medication prescribed by the physician, and blood pressure readings. Since these services are supplements to rather than substitutes for physician services, they do not impact on the GMENAC Requirements Model. These independent practices were excluded from the deliberations of the NPHCP Panel.

A small number of nurse practitioners indicated that they delivered primary care in remote or satellite clinics where a physician was seldom present and supervision was difficult or impractical. Physician supervision under these circumstances can be maintained through various combinations of telecommunications, standing orders, protocol, periodic physician visits, or chart reviews. Evaluation of practice in such sites shows that, under these circumstances, nonphysician providers do operate in the appropriate dependency relationship with the physician consulting or referring on all but routine medical problems.

Legal and regulatory concerns place substantial constraints on the activities of nonphysician health care providers. Often the mechanisms for certification and licensure of nurse practitioners and physician assistants as well as for the accreditation of training programs are ambiguous and in conflict among States.

Another regulatory constraint is inherent in the reimbursement policies of third party payors. Until recently, third party payors have not reimbursed for nonphysician services ordinarily delivered by physicians. However, new trends in legislation, for example, the Rural Health Clinic Services Act of 1977 (PL 95-10), provide medicare and medicaid coverage for medical services furnished by qualified physician assistants or nurse practitioners. A gradual liberalization of reimbursement policies can be expected, but legal constraints may dilute the impact of these policies.

Performance evaluation can be measured by quality of care, patient acceptance, physician acceptance, productivity, and cost effectiveness. It is difficult to measure the quality of services provided by the physician or the nonphysician. The evidence on patient acceptance of nonphysician health care providers is scant, but it does indicate that among patients using nonphysician providers the acceptance rate is high. Similarly, physicians who employ nurse practitioners and physician assistants accept them as team members in delivery of patient care. The major reasons given by the physician for hiring a nonphysician health care provider are to decrease work pressure, to spend physician time on more complex cases, and to increase the amount of patient education provided.

The available evidence on productivity and cost effectiveness of nonphysician providers is limited but generally positive. The addition of a physician assistant or a nurse practitioner to a physician's staff in the primary care specialties has been found to raise practice output by up to 40 percent for small practices and even higher for large practices. Severe limitations in the data on cost of care prevent a valid analysis in this area. Varying approaches and questionable methodologies used in the studies make definitive statements concerning productivity and cost effectiveness impossible. The weight of the evidence suggests that a substantial number of office visists can be safely delegated to nonphysician providers at some cost savings in certain practice settings such as health maintenance organizations.

d. Philosophy

The Panel arrived at certain philosophical formulations that underlie its approach and recommendations. The Panel confined its deliberations to five guiding tenets: (1) to limit its study to nonphysician services which substitute for physician services, (2) to identify reasons for supporting the concept of nonphysician providers, (3) to agree that nonphysician providers should always provide medical services in close alliance with a physician, (4) to determine the extent of utilization of nonphysician providers according to patient choices, and (5) to recognize an inverse relationship between the requirements for physicians and the requirements for selected types of medical visits by nonphysician providers.

While the topic of nonphysician health care providers is inherently comprehensive, GMENAC goals could most effectively be fulfilled by limiting its purview to those services provided by nonphysicians which have a substantial effect on the requirements for physicians.

Secondly, the Panel accepted several reasons for supporting the concept of nonphysician providers. When a shortage of physicians is projected, nonphysician providers increase the overall availability of quality health care service and decrease the amount of physician time when such services can be provided as well by nonphysicians. Nonphysician providers increase the geographic availability of health services, add new services such as patient education and counseling, and can decrease the cost of health care.

Thirdly, the Panel subscribed to the principle that the nonphysician provider should practice in a formally defined alliance with a physician. The Panel did not support the concept of independently practicing nurse practitioners and physician assistants for the provision of those health services included in the GMENAC Model. The Panel agreed with the recommendations, made in 1975 by the American College of Nurse-Midwives, that nurse midwives should practice interdependently in a health care delivery system and with a formal written alliance with an obstetrician, or another physician, or a group of physicians who have a formal consultation arrangement with an obstetrician/gynecologist.

The Panel also recognized the role of the consumer in determining the extent of nonphysician involvement in care and adopted the following as a guiding tenet: Patients, physicians, and nonphysician providers should jointly determine the extent of nonphysician provider involvement in care. The health care system should evolve in ways which enhance the opportunity for patients to assume a larger control of their health destinies.

A fifth principle guiding the Panel's deliberations on nonphysician providers is the inverse relationship between the requirements for physicians and the requirements for nonphysician providers for selected types of medical visits. An excess of physicians in 1990 could make delegation levels proposed by the Modeling Panel undesirable. It might be necessary to reduce the proposed delegation level at least for the short term until the production of physicians could be brought under control.

The Panel learned that nonphysician providers, such as physician assistants and nurse practitioners, have been accepted by patients and by physicians who work with them, that in some settings nonphysician providers are a cost effective mechanism for expanding services, that the quality of their services has been found to be satisfactory, and that there are some additional services that might be better performed by nonphysicians.

5. Findings

The empirical findings of the Panel relate to the present and projected supply in 1990, of nurse practitioners, physician assistants, and nurse-midwives. Crude estimates of the expected supply of active practitioners in 1990 can be calculated from knowledge of the current supply, the numbers of new graduates each year, and the expected retention rates in active practice.

a. Nurse Practitioners—Approximately 16,000 nurse practitioners have been graduated from formal training programs as of the end of 1979. It is estimated that there are 2,100 newly trained nurse practitioners graduating each year. The Panel assumed this rate to remain constant. The specialty distribution of the nurse practitioner can be estimated and the Panel assumed a constant distribution to 1990. Because data on this point do not exist, the Panel estimated that 75 percent of those trained as nurse practitioners are and will be active in 1990. The Panel projected the total active supply of nurse practitioners to reach 29,000 by 1990.

b. Physician Assistants—Approximately 8,800 fully qualified physician assistants are actively practicing at the present time. Approximately 1,500 new physician assistants are added to the supply each year. Data on retention within the active work force are not available. The Panel estimated that 80 percent of those trained as physician assistants will be active in 1990. The projection is 21,000 active physician assistants in 1990, if current financial support for training programs continues.

c. Nurse-Midwives—Of the approximately 2,000 fully qualified nurse-midwives, 1,000 are actively practicing. Currently there are 175 to 200 newly trained nurse-midwives graduating annually. The Panel expected the number of graduates to remain constant or increase slightly. It is estimated that at the present time only 51 percent of the qualified nurse-midwives are active in obstetrical/gynecological care. The Panel assumed that midwife participation in clinical practice will increase to 70 percent by 1990. The Panel projected the supply of actively practicing nurse-midwives to 2,800 by 1990.

The number of nurse practitioners, physician assistants, and nurse midwives will more than double by 1990. The Panel suggested that attention to the growth rates in these professions be closely monitored in the future in view of the impending oversupply of physicians.

C. Technical Panel on Geographic Distribution

1. Members

The membership of this Panel was constant from its inception. The Convener was a health economist and chairman of a rural medical school's department of family and community medicine with residency training programs in family practice and community health. Other GMENAC members serving on the Panel were a pediatrician from a large university medical center that has made major innovations designed to obtain a more favorable geographic distribution of physicians, and an internist, the chief operating officer of a hospital system in the Midwest. Because medical care geography and epidemiology are specialized fields having an identifiable data base and methodology, GMENAC appointed to the Panel six consultants who have made significant contributions to medical geography and epidemiology and to the public policy discussions related to it. The Convener of the Panel was also on the Panel on Finance, another member was on the Modeling Panel, and a third member was the Convener of the Panel on Nonphysician Health Care Providers.

2. Charge

The charge of the Geographic Panel was to develop options and recommendations to assist in reducing the unequal accessibility and availability of medical care services among communities. Despite a 31 percent increase in the aggregate supply of active physicians over the 1965–75 decade, the specialty and geographic distribution of physicians has caused continuing concern. The overriding question on the number of specialists and generalists needed for a given size population in a given geographic area remains highly controversial.

The specific charges were grouped into five categories: (1) describe and analyze the data on the unequal distribution of physicians per capita in 22 specialties, (2) describe variations in rates of utilization of health services related to local physician supply, (3) establish criteria for minimum acceptable levels of variation in the numbers of physicians and in the rates of utilization of health services, (4) analyze the effectiveness of governmental programs directed at improving geographic distribution, and (5) make recommendations to correct geographic over- and undersupply.

3. Accomplishments

This Panel significantly advanced the state of knowledge about data collection for manpower planning. The panelists discovered the total inadequacies both of using aggregate physician and utilization statistics to assess manpower requirements and of designating small geographic areas as adequately served or underserved using the aggregate statistics as criteria. Federal and local manpower planning have used data based on the physician-to-population ratio in a county to designate underserved areas. These data, so critical to many governmental programs directed at correcting shortages, have limited validity. The Panel developed a population-based concept in which the small area for geographic analysis became the functional medical service area. Use of this unit for geographic analysis will correct the data base for local and national planning.

Several accomplishments are of major significance.

a. The unequal distribution of physicians per 100,000 population in the 3,084 counties in the United States in 18 different specialties was documented by the Panel. The Panel constructed an extensive series of histograms that graphically portray the uneven distribution among counties and compare the national distribution with each State's distribution. In some specialties, the variation was twentyfold. Despite marked variations in physician-to-population ratios among different areas, the variations should not *ipso facto* be translated into maldistribution. The Panel examined a variety of ways of assessing the adequacy of physician manpower availability. The Panel recommended one method, based on health service areas and counties, for the near term and an alternative method, based on functional medical service areas, for the long term. The cause of the uneven distribution of physicians was explored through an extensive review of the literature in which 90 factors were found to be related to physician location choice.

b. Variations in per capita rates of utilization of health services in different areas were documented by the Panel and related to local physician supply. Health services were divided into low variation, where the need is met more or less uniformly throughout the service areas, and high variation, where the need is met at strikingly different rates in different areas. High variation indicates considerable discretion with regard to the decision concerning the need for these services. The uncertainty about the efficacy of the high variation medical services provokes an important public policy issue. If patient outcome information on efficacy were available for these medical services, the requirements for physician services could be projected with greater certainty. Until then, the decision to project requirements following a low utilization model versus a high utilization model remains a dilemma.

c. Present planning should use minimum physician-to-population ratios and maximum travel times for defining an adequate distribution of physicians in a circumscribed geographic area. Criteria were developed separately for emergency, obstetrical/gynecological, child, adult medical, and general surgical services. For future planning, the circumscribed geographic area should be functional medical service areas for each of the service categories. The functional medical service area, the keystone of the methodology, is the geographic unit within which the majority of the population receives a specified health service. The functional medical service area can be different for each type of health service: emergency, obstetrical, child medical, adult medical, or general surgical. Within these real market areas, criteria for service-specific minimum acceptable physician-to-population ratios and maximum travel-times-to-service can be applied. Health manpower shortage areas can then be identified.

d. The Panel studied the effectiveness of a variety of governmental programs established to improve the geographic availability of health services. Found to be effective in improving the geographic distribution of health services were: The National Health Service Corps, the Area Health Education Center Programs, programs to support the training of family physicians, and student loan and scholarship programs to train nurse practitioners and physician assistants.

e. The Panel forwarded 31 recommendations to the full GMENAC Committee.

4. Strategies

a. General Approach

The distribution of physicians by specialty per 100,000 population in the 3,084 U.S. counties was determined by an integration of two large data bases. Physician specialty data were self-reported for 1975 as recorded on the American Medical Association physician masterfile tape. The county population estimates were those of the United States Bureau of the Census, series P-26 for 1975.

The variation in utilization of health services was a topic examined by several of the consultant members of this Panel. These consultants presented their findings to the GMENAC Committee at one of the public plenary sessions. At another, a researcher presented data on recent trends which suggest that recently trained board certified physicians are practicing in less well served areas. The Panel related utilization data

to the data on physician supply. Minimal acceptable levels of variation in physician supply and services were arrived at by Panel deliberation after an extensive review of the literature on the subject. The effectiveness of a variety of governmental programs designed to achieve a more favorable distribution of health services was judged by the Panel after review of reports and evaluations.

The recommendations to improve the geographic distribution of physicians and health services were sorted into five categories: (1) the future monitoring of data, (2) the programs aimed at assisting medical schools and teaching institutions, (3) the incentives to medical students and residents, (4) the incentives to practicing physicians, and (5) the future research on the subject.

b. Review of the Literature

An extensive and significantly substantive review of the literature focused on three concerns: Current status of physician distribution, rates of utilization of health services, and criteria for the designation of medical service areas within which to assess the adequacy of physician supply.

Assessing physician distribution in the absence of an agreed upon small geographic unit for analysis is a serious impediment to progress in health manpower planning. States, counties, large zip code areas, and Health Service Areas were judged by the Panel as inadequate units of measure for an accurate data base. Recognizing the limited validity of the available data, the Panel, in the absence of a preferred alternative, used the county for its study of present physician supply and requirements for service. For the future, however, the Panel recommended strongly the adoption of a different measure.

Two- or threefold variations in the rates of utilization of health services from one location to another also confound health manpower planning. This dilemma has no solution until reliable studies of long term outcome of most medical tests, procedures, and therapies demonstrate their levels of efficacy. Until then, current normative rates have been used by GMENAC in manpower planning.

The task of defining the criteria for an adequate distribution of physician services is difficult in the absence of geographically defined functional medical service areas and the lack of consensus on appropriate rates of utilization for most medical services. Specific attention in the literature review was directed to published criteria or standards used to establish minimal acceptable levels of physician supply and health services. The bibliography is a significant contribution from this Panel.

c. Conceptual and Methodological Framework

The framework for the Panel's deliberations was based upon several kinds of information: (1) the data on physician-to-population ratios in every county, (2) the rates of utilization of health services per unit population in small geographic areas, and (3) an analysis of the literature on recommended physician-to-population ratios for each specialty and on recommended maximum travel times for each class of medical service.

The lack of a satisfactory method for determining the functional medical service area is a significant problem. The precision of health services planning at the local level depends on the accuracy of identification of the functional medical service area. To compile these data, which are presently unavailable, an accurate identification of the site where each resident receives his health service is essential. Functional medical service areas can then be defined and minimally acceptable physician-to-population ratios and maximum travel time in minutes-to-service for 95 percent of the residents of the area can be adopted as standards. In this way, criteria for designation of health manpower shortage areas can be established.

d. Philosophy

The Panel analyzed the available data but did not propose, because of limited time, empirically based criteria for determining whether an area has a shortage or surplus of health manpower. The Panel recommended a methodology which might be achievable by 1990. In the meantime the Panel recommended that the minimum acceptable physician-to-population ratio with respect to any given county be equal to one-half of the recommended ratio of specialists developed by the Modeling Panel. The Panel also recommended maximum travel times to each of these service categories to meet the needs of 95 percent of the population in those areas.

5. Findings

The findings of the Panel reveal the hazards of developing public policies to affect geographic and specialty distribution. One finding shows that geographic and specialty variations cannot *ipso facto* be translated into maldistribution. Another shows that medical services are used at dramatically different rates in different geographic areas.

a. The Panel discovered that a multiplicity of factors influence physician selection of geographic area for practice, but it also found it impossible to assign relative importance to each of these various factors. Personal, sociodemographic, and professional decisions as well as the expected life style, the community itself, and the demand for physicians were all components in the physician decision.

b. Variations in the amount and kinds of medical and surgical services used by residents of different geographic areas in this country and Canada are dramatic. In general, the smaller the geographic units being compared, the greater the variations in the population's use rates for medical services. Utilization variations did not reflect statistical artifacts nor differences among population groups studied. In most studies, there was a discrete correlation between the rates of use of specific procedures and the local availability of medical specialists performing them.

c. The absence of acceptable criteria for adequate availability of services poses a significant challenge to current methods for estimating manpower requirements. Current approaches assume that contemporary national average utilization rates represent a first approximation for projecting manpower requirements. However, the national average rates result from the weighted average per capita whereas the rates in local market areas vary extensively. The present, unanswered crucial question to investigate is, which rate is most beneficial?

Selected Physician Distribution Statistics by Specialty, 1975

Specialty	Number of Physicians in U.S.	Physicians per 100,000 Population in U.S.	Number of Counties Without Physician	Percent of All Counties (3084)	County Ratios per 100,000 Population		
					50th Percentile	90th Percentile	100th Percentile
All Specialties	307,155	144.2	167	5.4%	52.8	122.8	1299.4
Adult Medicine	109,615	51.4	180	5.8%	32.9	57.6	485.9
General Practice/ Family Practice	49,521	23.2	208	6.7%	25.2	47.4	136.4
Internal Medicine	48,459	22.7	1633	53.0%	0.0	15.7	380.8
Cardiovascular Diseases	6,381	3.0	2377	77.1%	0.0	3.0	28.2
Gastroenterology	1,945	.9	2730	88.5%	0.0	.5	25.0
Pulmonary Disease	1,885	.9	2700	87.5%	0.0	.7	43.5
Allergy	1,424	.7	2703	87.6%	0.0	.6	55.6
General Surgery	31,640	14.8	1202	39.0%	5.8	16.1	108.5
Obstetrics	21,177	9.9	1881	61.1%	0.0	10.1	55.9
Pediatrics	20,399	9.5	1978	64.1%	0.0	8.2	86.0
Psychiatry	19,525	9.1	2144	69.5%	0.0	6.8	104.2
Orthopedic Surgery	10,666	5.0	2218	71.9%	0.0	6.1	74.6
Ophthalmology	8,952	4.2	2079	67.4%	0.0	5.2	53.0
Urology	6,092	2.8	2256	73.2%	0.0	3.7	35.8
Otolaryngology	4,791	2.2	2366	76.7%	0.0	2.7	58.8
Dermatology	3,372	1.5	2504	81.2%	0.0	1.7	52.9
Neurosurgery	2,886	1.3	2675	86.7%	0.0	1.2	23.5
Plastic Surgery	2,066	.9	2750	89.2%	0.0	.6	44.4
Thoracic Surgery	2,044	.9	2668	86.5%	0.0	.9	19.6

d. Table 9 shows the unequal geographic distribution of physicians by specialty per 100,000 population across counties for 1975. The uneven skew is emphasized by the fact that less than 10 percent of all counties have physician-to-population ratios as high or higher than the national ratio of 144 physicians to 100,000 population. There were 5.4 percent of the Nation's counties without a physician. For general internal medicine and pediatrics, there were 53 percent and 64 percent, respectively, of the Nation's counties that did not have one of these specialists in 1975. For all physicians in all specialties in 1975, there was greater than a twofold variation in the physician-to-population ratio between the higher served counties, 90th percentile, and the normatively served counties, 50th percentile. For general surgery, there was almost a threefold variation and for family physicians almost a twofold variation. When Health Service Areas (HSA) were used as the geographic unit of analysis, narrower variation was evident. For adult medical care, internal medicine, and general/family physicians, the variation narrowed from 42 physicians per 100,000 population at the 50th percentile to 64 physicians at the 90th percentile. The disparate geographic distribution is even more pronounced in some of the other specialties as reported in the full report of the Technical Panel on Geographic Distribution.

e. The variation in surgical procedure rates from one area to another and the inconsistency of the variation when eight surgical procedures were considered in each of the areas suggest that the high-to-low variation continuum represents the apparent discretionary zone in clinical decision making.

f. The argument is made that large variation in use rates are characteristic of those conditions for which there is little consensus on which treatment is most efficacious. Given the positive correlation between specialist supply and local procedure rates, the thesis is advanced that specifying the requirements for a particular specialty may have the unintended effect of establishing the rate of use of high variation procedures.

g. The Panel members developed minimum acceptable levels of variation in physician supply and in rates of utilization of health services. They based their suggestion on physician-to-population ratios at one-half the level required by the GMENAC Modeling Panel estimates.

h. Table 10 compared the GMENAC estimates of manpower requirements in seven surgical specialties to meet the estimated surgical needs of 1990 with the low and high figures of a New England Study. The New England Study of surgical utilization rates demonstrated two- to threefold variations among different areas. For most specialties, the range of rates of actual use of services in New England produced manpower requirements for the Nation that bracket the GMENAC estimate. For some specialties, such as ophthalmology and particularly plastic surgery, the rates of use of services in most areas in the New England Study were substantially below the rates on which the GMENAC requirements estimates were based. The implication is that for each of the listed specialties, there were areas in New England for which GMENAC estimates represented an overestimate of the number of physicians needed. Reciprocally, there must be other areas in New England and elsewhere in the Nation for which the GMENAC estimates represent an underestimate. While most of the studies of variations in specific procedure rates concentrate on surgical services, there is evidence that variations in medical service rates are at least as great as those

1990 U.S. Manpower Requirements for Seven Surgical Specialties (Surgical Care Component Only) Comparison of Requirements Based on GMENAC's Estimates and on New England's[a] Observed Utilization Experiences in Low and High Use Areas

Specialty	Based on GMENAC's Estimate	Based on New England[a] Utilization Experiences			
		Low	Ratio to GMENAC	High	Ratio to GMENAC
General Surgery	8,422	6,019	.71	11,005	1.31
Obstetrics/Gynecology	11,334	5,705	.50	15,118	1.34
Ophthalmology	840	394	.47	872	1.04
Orthopedic Surgery	4,126	2,290	.56	4,921	1.19
Otolaryngology	1,532	1,126	.73	2,449	1.60
Plastic Surgery	1,548	602	.39	938	0.61
Urology	2,156	1,626	.75	2,521	1.17
TOTALS	29,958	17,762	.59	37,824	1.26

[a]For the 10 largest hospital service areas in the 3-state area of Maine, Rhode Island and Vermont, rates for surgical procedures by specialty for a 3-year period were obtained. Populations in the 10 areas ranged from 62,595 to 179,596. For each procedure category, rates in the high and low areas were used to estimate the manpower requirements, using the assumptions concerning productivity made by GMENAC's Requirements Model. Detailed computations are available in GMENAC paper, *Variations in Population-Based Use Rates and Expenditures: Implications for Manpower Policy* by John Wennberg, Coralea Lapenas, Richard Green, and Michael Zubkoff.

for surgical procedures. The most beneficial rate is unknown. The GMENAC estimates, therefore, cannot be applied to a specific geographic locale merely by a proportional calculation based on population size.

i. Table 11 presents the ranges of information available on physician-to-population ratios and on travel times. Two basic premises underlie the development of this Table. Time-to-service figures are preferred to miles-to-service because of variations in transportation and in general conditions such as terrain and climate. The second premise is that physicians of a defined specialty often perform services outside the unique scope of that specialty. Therefore, specialties were not used as the framework, but services were grouped into five categories. The Panel believed that these basic types of health care services should be accessible to residents of all areas of the United States and that acceptable standard ratios of physicians to population and maximum time-to-service figures for 95 percent of the population should be established.

Summary Table of Significant Data Items Related to Criteria for Determining Adequacy of Service

Services[1]	Ratio of Physicians per 100,000 Population			Geographic Areas for Analysis		Criteria for Adequacy of Service		
	U.S. Actual 1975	Review of Literature Range of Requirements	GMENAC Range of Requirements 1990	GMENAC Recommended	GMENAC Suggested Interim	Minimum Physicians Per 100,000 Population GMENAC Recommended[2]	Maximum travel times to Service, Minutes Literature	Maximum travel times to Service, Minutes GMENAC Recommended
Emergency Medical Services	1.4–4.7[3]	N.A.	5.3–5.7	EMS Region	N.A.	2.7–2.9	5–30 Min.	30 Min.
Obstetrical Services	19.4[4]	2.6–12.2	18.4–20.0[4]	Hospital Service Area	HSA Service Area	9.2–10.0[4]	30 Min.–1 Hour	45 Min.
Child Care Services[5]	32.9[6]	5.5–23.2	47.1–51.2[7]	Physician Service Area	HSA Service Area	23.6–25.6[7]	30 Min.–1 Hour	30 Min.
Adult Medical Care Services[8]	23.2 (FP/GP) 22.7 (GIM)	50–133.0 (FP/GP) 3.3–50.0 (GIM)	33.2–35.7 (FP/GP) 28.7–30.8 (GIM)	Physician Service Area	County	16.6–17.9 (FP/GP) 13.4–15.4 (GIM)	20 Min.–1 Hour	30 Min.
General Surgical Services	14.8	1.7–12.4	9.4–9.8	Hospital Service Area	HSA Service Area	4.7–4.9	30 Min.–2 Hours	90 Min.

N.A. Not Applicable

[1]The columns which display numbers of physicians per 100,000 population for each of the services listed in this column refer exclusively to the following specialties, respectively: emergency medicine physicians; obstetricians/gynecologists; general pediatricians; family physicians; general practitioners/general internists; and general surgeons. A certain amount of these services are provided by other specialists but those shares have already been discounted from the figures. For example, the obstetrical services provided by family physicians and nurse midwives have already been discounted from the numbers of obstetricians/gynecologists given in the Table.

[2]One-half of GMENAC Modeling Panel need-based estimate.

[3]Range of ratios from AMA, DHHS and American College of Emergency Physicians (1978–80)

[4]Per 100,000 women of all ages

[5]Fifteen percent of patients are expected to be older than 15.

[6]Per 100,000 children under 16

[7]Per 100,000 children under 17

[8]Fifteen percent of the FP/GP requirements profile will be in child medical care.

D. Technical Panel on Educational Environment

1. Members

Three Panel members were chosen from GMENAC. Seven consultants, who were not members of GMENAC, participated substantially in the deliberations. These consultants included persons involved in medical education at the national, medical school, and residency program levels. The Convener of the Panel is the dean of a college of osteopathic medicine. Another member is a chief resident in pediatrics, and the other the director of the graduate medical education programs of the U.S. Navy. Two of the members were also members of the Financing and the Nonphysician Panels.

2. Charge

The general charge of the Panel was to study the relationship between educational environment and specialty and subspecialty career choices. The educational environment was defined in its broadest sense, that is, education was considered a chronological continuum from childhood until medical practice. The specific charge included both evaluative and developmental tasks. The Panel was asked to analyze personal and behavioral aspects of career choice and to evaluate the effects of undergraduate and graduate educational variables on career choices. The charge included examining the educational opportunities for disadvantaged students. The final charge to the Panel was to develop educational effector strategies to influence career choice considering both regulatory and voluntary mechanisms.

3. Accomplishments

The accomplishments of the Educational Panel included formulation of a broad definition of the educational continuum, clarification of the role of the educational environment relative to the other factors along the educational continuum, and the formulation of recommendations as to how the educational institution can help achieve a better balance of physicians in the various specialties.

a. The Panel identified and elaborated upon the dozens of factors, from birth through the early years of practice, which influence the choice of a specialty. These myriad factors operate continuously, each one contributing a small part to the ultimate choice. The Panel effectively informed the Committee of the complex nature of the process and the improbability of identifying single decisive elements, which could be influenced in order to achieve a different specialty distribution of physicians.

b. Focusing more narrowly on institutional influences, medical schools and teaching hospitals, the Panel utilized the concept of the educational continuum. This continuum from entrance to medical school through completion of residency training provides many different kinds of influences, but again, these are interactive. Each influence may contribute only a small weight to the final choice, and the pre-institutional and post-institutional factors may be just as, or even more, critical in influencing specialty or geographical choice.

c. A major accomplishment of the Panel was to point out the inherent complexity of this subject. Therefore, the Panel cautioned against identifying factors in the teaching institution which might be modified as an instrument of public policy to achieve a different specialty distribution of physicians. The Panel's recommendations spoke for a very broad and coordinated approach if specialty distribution is to be modified deliberately.

4. Strategy

a. General Approach

Drawing from an extensive review of the literature the Panel constructed a framework to examine the manner in which the educational environment might influence specialty choice. In its deliberations, the Panel isolated several topics of concentration: (1) the definition of the boundaries of the educational environment, (2) the distinction among specialty preference vs. choice vs. attainment, (3) the timing points on the educational continuum of specialty choice, (4) the data collection problem based on input-output analysis and univariate vs. multivariate analysis, (5) the classification and terminology problems resulting from aggregating and grouping specialties, and (6) the interrelationship of various career choices.

The Panel used a judgmental approach after concluding that empiric data would not be maximally useful for several reasons. A narrow definition of the boundaries of the educational environment includes the medical school and the teaching hospital. This limited definition inhibits manpower planning because it excludes the multiple external influences determining specialty choice. The broad definition of the boundaries of the educational environment, called the educational continuum, includes the premedical school to post-training period. This expanded definition impairs manpower planning because it encompasses too many factors to manipulate for results. In the preferred broad definition, the combination and interaction of the educational environment with student characteristics and with economic influences were examined to determine the specialty choice decision.

Several overriding considerations framed the deliberations of the Panel. These concern: (1) the inseparability of the educational continuum from pre- and post-educational considerations, (2) the merits of voluntary as opposed to regulatory mechanisms for change, (3) the need to preserve the present diversity of medical education institutions, (4) the consequences of a projected constriction of the fiscal situation in medical education, and (5) the need to coordinate solutions to the several problems which medical education now faces.

b. Review of Literature

The review of the physician specialty choice literature was selected to answer the question: does the literature indicate possible mechanisms for modifying specialty distribution via the educational environment? The literature review was organized into three categories: (1) economic considerations including the cost of medical education and anticipated earnings, (2) student characteristics including psychological or personality traits, academic and intellectual abilities and aptitudes, and sociological or background attributes, and (3) institutional influences including medical schools

and teaching hospitals. These three divisions show the areas of possible influence on an individual's specialty choice to ascertain points of intervention that might influence the decision.

The evidence in the literature that economic factors influence specialty choice is inconclusive. The large increase in medical school tuition undoubtedly increases the indebtedness of the students, but the impact of this fact on specialty choice remains unknown. Higher levels of indebtedness might encourage students to enter practice without undertaking a long period of subspecialty training, or the indebtedness might encourage students to enter training in those fields in which the remuneration is most lucrative. Rising cost of medical education might increase the number of medical students from higher socioeconomic backgrounds, which in turn might increase the tendency toward subspecialization. Economic considerations are significant along the entire continuum, but do not provide any clear direction for possible policy initiative.

Demographic-cultural-sociologic-economic traits are found to be unreliable predictors of specialty choice for students. This topic dominates the literature, which suggests that the promise lies not in the selection of students but in the shaping of the educational experiences. Sociological characteristics distinguish family/general practitioners from other physicians, and psychological factors distinguish psychiatrists and surgeons from other physicians. It is, however, difficult to assess whether this difference is real or simply attributable to historical trends in research. The examination of personality differences in relation to specialty choice does not promise policy makers solutions for imbalances in the supply of doctors either. The literature reveals that generalizations about sub-groups can be made but definitive individual determinants of specialty choice do not presently exist and may never be developed.

A review of the literature on the influences of the institutional environment on specialty choice reveals a classification of influences based on the immediacy of their impact on the exposed individual. First order effects have a direct influence, second order effects are filtered through the first order elements, and third order effects are filtered through second order factors, and then first order factors. First order factors are the socializing agents which shape the knowledge, skills, values, attitudes, and interest of the trainee to those of the group of which he will be a member. Role models are the primary socializing agents since they serve as examples of the already socialized group members whom trainees are attempting to emulate or imitate. Also important in the process of socialization is the availability of opportunities to role play, that is to test or practice newly acquired knowledge, skills, values and attitudes. Role playing permits the trainee to perfect his role behavior by receiving feedback from others. From the complex of role models and role playing there emerges an overall orientation, which is often referred to as the institution's value climate or culture. Second order influences relate to those factors which determine the type of socialization which the trainee will receive from role models. Any effects must be on the third order and would be so diluted by intervening effects that they would be of little interest to policy makers seeking efficient and effective methods of influencing specialty distribution.

This tripartite review of the literature led to the conclusions: (1) that individual student characteristics correlate with specialty choice but not very strongly, (2) that the first order institutional influences of role models, role playing opportunities, and the emergent value climate are most important in terms of how they have impact on an individual, (3) that second order institutional influences, such as the allocation of program resources, determine the flavor of the first order influences, and (4) that third order economic and social political factors within and without the educational environment affect career choices indirectly and through the chain of lower order influences.

c. Conceptual and Methodological Framework

The Panel formulated a conceptual framework comprised of six different topics which might have an impact on specialty choices made by students in the medical schools and teaching hospitals. These topics include: (1) the definition of the boundaries of the educational environment, (2) the distinction among specialty preference-choice-attainment, (3) the timing of specialty choices, (4) the aggregation of grouping of specialties, (5) input-output analysis and utility of its results for policy making, and (6) the interrelationship of various aspects of career choices.

The problem inherent in the topic, educational environment, is a problem of definition. Medical education is generally regarded as the scientific and professional training of physicians provided by medical schools and teaching hospitals. This accurate but narrow definition excludes both the period and its sphere of influence prior to medical school and the period of post-residency when significant specialty change and geographic mobility occur. The narrow definition excludes the internal and external forces that determine the choice of specialty and of geographic location of the physician. Assessing the impact of the educational environment on specialty choice and geographic distribution is nearly synonymous with assessing almost all psychological, intellectual, academic, and sociological facets of the student and the entire value climate of the medical school and the teaching hospital.

The boundaries of the influence of the educational environment must embrace both pre- and post-education elements. Medical students and residents possess certain information, expectations, conceptions, and misconceptions about medical practice, its responsibilities, demands, organization, and reimbursement, which affect specialty and geographic choice. Central to the Panel's efforts was consideration of the manner in which the broadly defined educational environment molds and modifies choice.

A second conceptual consideration, specialty attainment, also confounds precise analysis and challenges the manner in which intervention in the educational environment can influence specialty choice. This distinction recognizes that events may intervene between preference and choice, which will reroute actual attainment. The present effort focuses on identifying and evaluating the efficacy of such intervening events in the educational environment.

Unfortunately, much of the research on medical specialty choice fails to maintain the distinctions among preference, choice, and attainment. Thus, in a typical study, medical students are surveyed for their specialty preferences at some point during their first, second, or third year of medical school. Then these early preferences are compared to the specialties of their first or later year of residency, or of their practice. It has been observed that until the recent scarcity of residency positions in certain specialties, there was no differentiation made among preferences, choice, and attainment. However, this observation puts the entire onus for diverting preferences on the supply of residencies and fails to acknowledge the continued likely influence of other factors such as those concerning personal situations and the phenomenon of faculty sponsorship. The specialty career attained by an individual at the completion of GME is not immutable. Post-educational specialty switches, which can include a return to the educational environment for GME training in a new specialty, are not rare. These considerations lend further skepticism to the desirability of intervening in the educational environment to achieve a manpower result.

The specialty choice continuum begins at birth and extends into the practice years (see Figure 8). Many influences on specialty choice are applied along the entire continuum. The influences of the teaching institutions are only contributions to the overall process. However, formal decisions on specialty choice must be made later in medical school and during graduate medical education. The timing of the specialty choice or the points on the educational continuum when students form preferences for a specialty and make their choices is a critical factor in the identification of effective mechanisms for influencing choice. The time schedule of choice points includes entrance to medical school, declaration of a specialty, branching, and switching. (See Figure 8).

At entrance to medical school, students seem to classify into two groups: Those whose specialty preference is crystalized before medical school and does not seem to waver anywhere along the continuum, and those without declared preference. Even for those students with declared preferences, however, it is unclear whether their preferences are impervious to influences in the educational environment or whether they attend medical schools and take residencies in teaching hospitals which reinforce their preferences. For the group with no clear preferences for particular specialties as they enter the educational continuum, research seems to indicate that certain personality types have basic psychological predispositions to certain broad areas of medicine. It seems, when compared to students with decided preferences at entrance to medical school, the latter group is more susceptible to the influence of the educational environment and, therefore, to interventions via that environment.

A second decision point occurs in the senior year of medical school. While the dynamics of preference formation and actual choice might be separate decisions, these two aspects of intended specialization first enjoin for most students in January of their senior year of medical school when they must submit a list to the National Resident Matching Program. For the majority of students, this is the first point on the continuum when they must make a choice. Some students avoid making that choice at this point by applying to flexible programs or to programs of a specialty, such as general internal medicine or general surgery, which can serve as a prerequisite to

other specialties. It is not known what proportion of applicants to such programs is delaying choice, what proportion is electing the programs as a prerequisite to training in another specialty, or what proportion is taking them as a graduate training for the intended specialty.

The timing of the third major decision point, called branching, depends upon the specialty being considered. The decision for the resident is basically one between continuing in GME training in the general specialty, which is prerequisite to the subspecialty he is considering, or branching to a residency in the subspecialty.

The fourth major decision point, called switching, occurs during the first or even subsequent years of GME when residents switch from one major area of medicine to another, such as from family practice to pediatrics. Branching is more common than switching. Influence on any of the four points in the continuum can be effective.

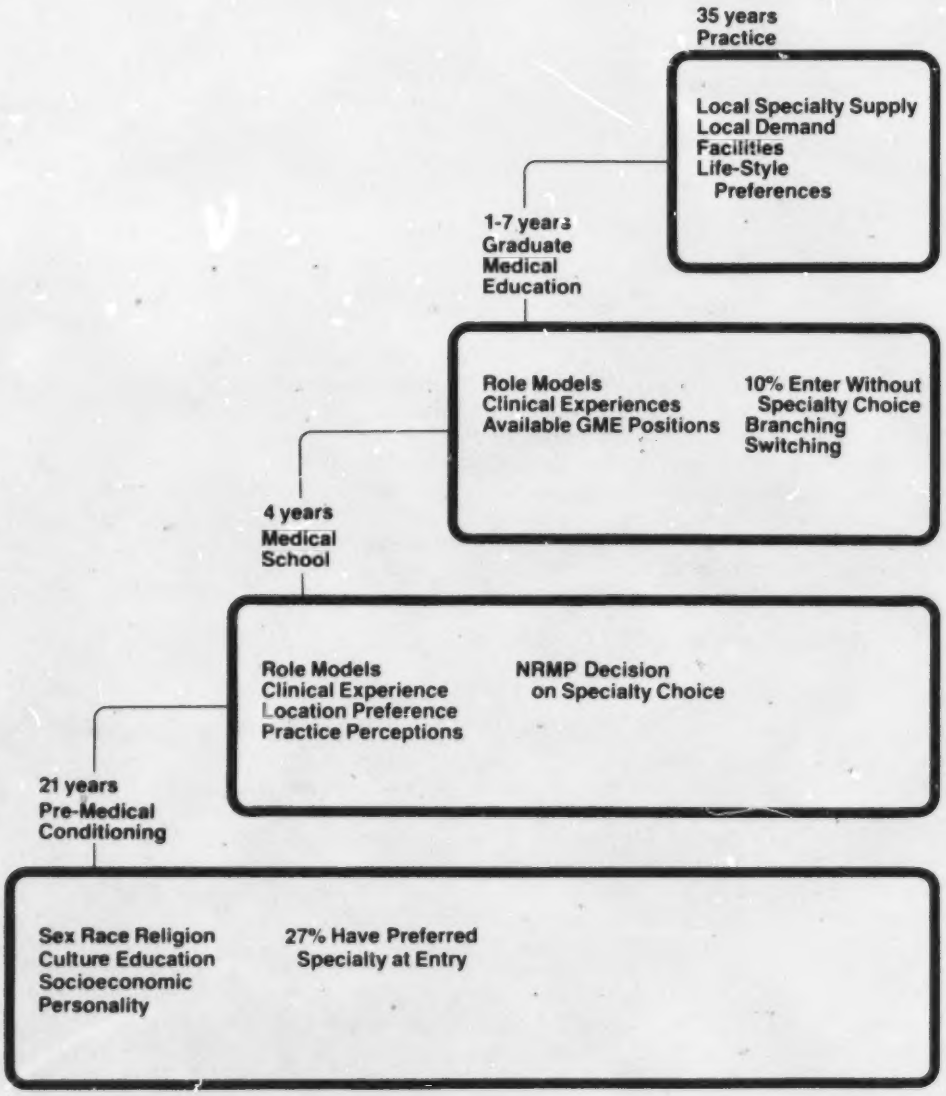
Another kind of obstacle impairing understanding of the role of the educational institution in specialty distribution is the overlapping classification and vague nomenclature used to identify specialties and types of care. Specialties are grouped in a variety of different ways, such as general practice versus specialization, hospital-based versus office-based specialties, and primary care versus nonprimary care. Terminology confuses what is meant by primary, secondary, and tertiary as applied differently to specialties, institutions, and care.

A methodological consideration adds further complexity to manpower planning. Early research was largely based on input-output analysis and more recent research uses multivariate analysis. The input-output research simplifies a complex social organization by simply looking at the output of a medical school relative to the professional activities of its graduates. This input-output analysis has led to some recommendations to change the specialty mix among physicians by increasing the enrollment in certain kinds of medical schools and decreasing enrollment in others. This simplified approach excludes multivariate factors, most of which exist outside the domain of the medical school, that influence specialty choice. More recently, research using multivariate analysis has demonstrated that a sound scientific approach to analysis of a great many influences on specialty choice can be successfully applied. The data obtained by multivariate analysis are not very extensive at this time but promise to illuminate this complicated subject in the future.

Another constraint in the attempt to influence the career decision process concerns the interrelationship between the choice of specialty and other choices being made at the same time. Other aspects of physicians' careers that assume importance in specialty choice are: Geographical location, professional work activities, practice employment settings, characteristics of the patient population served, and the work load. All of these factors appear to be interrelated. In the instance of specialty and geographic choices, each can act as a constraint on the other depending on which

Figure 8

Specialty Choice Continuum



choice is dominant. If location, particularly preference for rural location, is the dominant concern, specialty choice may be constrained by the size of the patient population, patient demand, the presence of other specialties, and hospital facilities. Likewise, when specialty choice or desire for teaching and research are dominant the range of geographic choices is narrowed.

The Panel concluded that interventions in the educational environment should not and cannot constitute the sole approach to correcting specialty imbalances. As students progress along the educational continuum, they receive a greater amount of informally relayed information on how medicine is practiced in the post-educational environment, partly because they seek such information as an aid to defining their career plans, and partly because they are increasingly exposed to practice patterns. Thus, it would seem that the practice environment, in a feedback manner, as well as the educational environment, in a direct manner, both affect their career decisions.

d. Philosophy

The philosophical posture of the Panel spoke forcefully for the desirability of a long-term approach to coordinate the numerous components influencing specialty choice. Multiple factors throughout the 30 years of pre-practice life of a physician can influence the choice of a specialty. These influences from birth to practice have different levels of importance for each individual. The medical school and the teaching hospital are only single sets of influences over a lengthy pre- and post-educational continuum. The Panel emphasized the uncertain or modest influence of the educational environment, the need to protect diversity in medical education, and the merits of voluntary as opposed to regulatory mechanisms for change.

E. Technical Panel on Financing

1. Members

Membership of the Technical Panel on Financing changed as the terms expired and new members were appointed. At the time of the final report, members included an insurance company officer, a registered nurse, a resident in pediatrics, an ophthalmologist, a dean of a college of osteopathic medicine, a physician executive of a large urban medical and teaching center, an academic economist who directed a department of community medicine in a medical school, and a political economist who is the administrator of the Health Resources Administration. The Convener of the Panel for its duration is the director of a university hospital.

One member of the Finance Panel was also Convener of the Panel on Geography, and another member was Convener of the Panel on the Educational Environment. Two members served on the Panel on Nonphysician Health Care Providers, and one member served on the Modeling Panel. Several expert consultants in the economics of health care financing and in medical education presented valuable information and viewpoints.

2. Charge

The original charge was to identify the issues and options related to the financing of graduate medical education, emphasizing those that would have impact on the geographic and specialty distribution of physicians. The Panel was to recommend a comprehensive program for the financing of graduate medical education in order to help achieve the recommendations made by GMENAC. The scope of the charge was expanded to include the examination of financial issues in undergraduate medical education as well as in medical practice. Both are believed to influence graduate medical education and the achievement of a balanced distribution of physician services.

For purposes of GMENAC, both direct and indirect mechanisms for financing graduate medical education were examined. Direct financing of GME means direct payment through such mechanisms as scholarships, loans, and special project grants for an explicit objective. Indirect financing means the use of revenues from medical services to finance the cost of the training program.

3. Accomplishments

The accomplishments, broad in scope, included analyses of current costs and support for GME and the identification of issues and problems in current methods of GME financing. The Panel also investigated methods of estimating the distribution and cost of house staff in the provision of medical care services, identified alternate mechanisms for GME financing, and made short- and long-term recommendations.

a. The Panel identified the total direct expenditures for graduate medical education in all specialties in the United States (approximately $2 billion per year). The revenues to support these expenditures and the distribution relative to sources of payment have been identified. Greater than 80 percent of the cost of graduate medical education is derived from revenues from patient services provided largely on inpatient hospital units.

b. An extensive review of the literature examined the impact of funding graduate medical education on physician specialty choice and the impact of physician reimbursement schedules on specialty and geographic choice.

c. The Panel critically assessed the impact of various Government programs of financial assistance to students and medical schools on specialty and geographic choice.

d. The Panel made 24 recommendations to achieve an optimal balance of physicians by specialty and geography. These recommendations affect undergraduate medical education, graduate medical education, payment for physician services, and the role of State and local governments.

4. Strategies

a. General Approach

The Panel identified several major ways in which financial factors can influence graduate medical education and used this formulation as the conceptual basis for its deliberations. The Panel devised and incorporated several strategies to arrive at its findings and recommendations: (1) it served as a forum for debate by experts and other interested parties on financing issues, (2) it initiated a report by the Urban Institute on financing medical education, entitled *Financing Medical Education: Issues and Options*, and (3) it conducted two elaborate reviews on the issues of financing and reimbursement, entitled *The Relationship Of Physicians Fees And Income To Specialty And Location Choice* and *Considerations In Financing Graduate Medical Education.* (See *GMENAC Interim Report, 1979*).

The financing mechanisms were compared with the nonfinancing alternatives of the Geography and Education Panels. Financing mechanisms were identified as one appropriate mode to affect specialty and geographic choice.

b. Review of the Literature

The literature on financing graduate medical education is recent but extensive. The review was organized into three divisions: (1) allocation of the residents' time among patient care, education, and research, (2) the economic value of the patient services provided by residents related to resident stipends, and (3) the cost of graduate medical education. The literature reviewing the relationship between reimbursement levels and income to specialty and locational choice was also researched. (See *Interim Report*, 1979).

Two additional monographs on financing graduate medical education were commissioned for GMENAC. *Issues in Who Should Pay for GME* was prepared by the National Center for Health Services Research. A second monograph, now published as a book, entitled *Financing Medical Education—Issues and Options*, was researched and written by members of the Urban Institute under contract with the National Center for Health Services Research.

c. Conceptual and Methodological Framework

The Panel deliberated on financing undergraduate and graduate medical education, on payments for physician services, and on the role of state and local governments in providing financial support. The intent of the Panel was two-fold: (1) to encourage continued financial support of programs in the primary care specialties, and (2) to achieve the dual goal of relieving financial barriers to medical education and alleviating shortages of physicians in underserved areas.

The Panel reviewed three types of grants to medical schools: (1) capitation grants, (2) income or block grants, and (3) categorical special project grants. Of these three methods for providing support to institutions, only special project grants are effective in modifying physician specialty distribution. Special project grants to teaching hospitals are the single most effective mechanism for increasing the supply of physicians in a designated specialty. Often, as in the case of family practice, special project

grants must be given to both the teaching hospital for the support of residency positions and to the medical school for the development or strengthening of an academic department and its teachers.

The Panel assessed the effectiveness of unrestricted and restricted scholarships and loan programs to medical students. The Panel encouraged the continuance of unrestricted programs to insure medical education for qualified students from moderate to low income backgrounds and underrepresented ethnic groups. The unrestricted programs, however, do not necessarily affect specialty or geographic distribution. Restricted loans with forgiveness clauses and scholarships with pay-back clauses influence geographic distribution because they require service in underserved areas.

The major impediment to clarity on financing graduate medical education is the inseparability of the time (and cost) spent in training from the time (and cost) spent in delivering services. In the current year, the direct cost of graduate medical education is approximately $2 billion, of which 80 percent is derived from patient care revenues. The problem of financing GME is exacerbated by diverse accounting procedures and by reimbursement regulations, which do not recognize the cost of training in some sites. Currently used hospital accounting procedures are not likely to allocate either indirect costs or revenues to a specific training program. The failure of the reimbursement system to recognize the costs of training in some sites favors continuation of GME largely in acute hospital settings, which is in conflict with other health policy objectives.

Reimbursement mechanisms, including the payment of physicians through the usual-customary-reasonable (UCR) method and the level of reimbursement for ambulatory and hospital charges, are thought by the Panel to introduce incentives contrary to currently desired directions. The UCR method promotes the selection of a practice site where reimbursement levels are high, favors the use of tests and procedures, and encourages hospitalization over ambulatory care. This view represents the informed opinion of Committee members, in contrast to results of empirical investigations. The research data are equivocal on the relationship between specialty choice and the professional fee reimbursement schedules derived from the UCR method. Since the UCR method does not provide incentives that emphasize primary care, ambulatory care, or practice in underserved areas, the Panel suggested that alternative reimbursement mechanisms be explored.

State and local government appropriations for the medical schools and for teaching hospitals have increased substantially in the last decade. Investigation shows that problems with the geographic and specialty distribution are more likely to be discerned at a local level and solutions conceived and implemented at that level are more likely to succeed than programs developed centrally. For these and other reasons, the Panel concluded that new efforts at Federal-State-local collaboration merit consideration and trial.

d. Philosophy

It is the view of the Panel that alterations in methods of financing undergraduate and graduate medical education and changes in the system of reimbursement for medical services offer valid mechanisms for influencing the specialty and geographic distribution of physicians. GMENAC recognizes, however, that modifications of the existing reimbursement system are achievable only in the long term. For the present, financial incentives at the undergraduate and graduate level have greater potential for influencing physician specialty and geographic distribution. The undergraduate educational environment, the overall enrollment levels, and the numbers of the first-year places in GME appear to influence specialty choices made by students. The graduate level seems appropriate for intervention since specific specialty and location choices are exercised finally at this level.

VIII. Concluding Statement

The Graduate Medical Education National Advisory Committee, after three years of intense study, using newly developed mathematical models for estimating the future supply and requirements for physicians, concludes:

1. There will be 70,000 more physicians than required in 1990.
2. Most specialties will have a surplus.
3. Some specialties will be in balance, including the primary care fields of osteopathic general practice, family practice, general internal medicine, and general pediatrics.
4. Shortages will be experienced in psychiatry, physical medicine and rehabilitation, and emergency medicine.
5. Valid criteria for designating geographic areas as adequately served or underserved have not been developed.

Factors contributing to the impending surplus in 1990 are the increase in entering class size of U.S. allopathic and osteopathic medical schools from 8,000 to 19,000 over the past 14 years, the yearly influx into practice of three to four thousand alien and U.S. citizen graduates of foreign medical schools, and the steadily rising numbers of medical visits cared for by nurse practitioners, physician assistants, and nurse-midwives.

GMENAC recommends: A 17 percent decrease in U.S. medical school enrollment compared to current levels; sharp restrictions of the entry into the United States of students from foreign medical schools; no further rise in the number of nonphysician health care providers being trained; and prompt adjustments in the number of residency training positions in individual specialties to bring supply into balance with requirements in the 1990s.

Other recommendations relate to the desirability of increasing the number of minorities in medical school, the urgent need to develop criteria for assessing the adequacy of health services in small geographic areas, initiatives to improve the geographic distribution of physicians, programs to emphasize ambulatory care and training, and new professional service reimbursement plans to help achieve health policy objectives.

The Report will be successful it it generates controversy, and improvements. GMENAC is an experiment in policy development through collaboration between the private sector and the Government working in open public forum. The collaboration should proceed into its next phase.

☆ U.S. GOVERNMENT PRINTING: 1981—751-469